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WIC VENDOR ISSUES STUDY, 1991

Final Report

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WIC VENDOR ISSUES STUDY, 1991

Final Report

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EXECUTIVE SUMMARY

OVERVIEW

The Special Supplemental Food Program for Women, Infants, and children (WIC) is administered at the Federal level by the U.S. Department of Agriculture, Food and Nutrition Service (FNS). In addition to providing food assistance and nutrition education, the Program is designed to serve as an adjunct to ongoing prenatal and pediatric health care by operating through a network of local institutions, including county health departments, hospitals, and other nonprofit human service organizations.

In the retail purchase system, persons eligible for the WIC Program are issued a monthly food package in the form of one or more food instruments (FIs) redeemable at State-authorized vendors. FIs may be checks, drafts, or vouchers. In all cases, the FI has the type, size, and quantity of food that may be purchased written or printed on its face. Retail grocers accept FIs in exchange for the authorized foods listed, record on the FI the total price of the food purchased, and then submit the FI for payment. This transaction is formally witnessed only by the participant and the vendor.

Since WIC is not an open-ended entitlement program, constituents suffer if there is a high prevalence and magnitude of fraud and abuse by retail vendors participating in the program. Two previous Office of the Inspector General (OIG) audits conducted on a preselected sample of vendors documented considerable variability in the accuracy of the dollar amounts charged to WIC. This study was designed to examine the prevalence and magnitude of overcharging and certain procedural violations by WIC vendors at the national level.

INVESTIGATIVE PROCEDURES

Reliable estimates of both the dollar loss to the Federal government due to vendor overcharging and the number of vendors that commit abuses required that the data collection methodology approximate the behavior of WIC participants as closely as possible. This was accomplished through the use of experienced investigators trained to simulate the conduct of target store clientele. Transactions involved the use of compliance buys, an undercover investigative method used to evaluate vendor compliance with procedures for cash transactions.

Data collection

The primary data collection form, referred to as the Compliance Buy Outcome Report (CBOR), was designed to capture transaction data for the following items, for each FI used in the study:

- the quantity, size and item description of each WIC food to be purchased
- the quantity, size and item description for each item actually purchased
- receipt price data

- unit and total shelf price data
- a price code indicating the method used to verify the shelf price.

The record also contained space for recording each purchased item's condition.

Verified, totaled shelf price data were compared with the vendor's redemption price for each FI to determine whether overcharging occurred and the dollar value of overcharging's contribution to Federal dollar loss. Other data documented various types of program abuses, and investigator comments concerning any miscellaneous observations which might be useful in interpreting the open-ended questions in the instrument.

Sample selection

Vendors for the study were chosen using a two-stage probability selection designed to be representative of most retail distribution in the 46 contiguous retail distribution states and DC. Vendors in 30 states were selected and included 277 major chain stores and 1,167 non-chain stores for a total initial sample of 1,444 vendors. A drop off rate of approximately 15 percent was expected due to store closings, blown undercover procedures, or other reasons. The final sample size was 1,205 vendors. The final sample weighted up to 34,033 vendors, 78 percent of the total of 45,864 vendors reported to FNS by all States utilizing a retail purchase food delivery system for Fiscal year 1991. No vendors receiving authorization after the initial request to the States in Fiscal Year 1990 were included in the study.

The assignment of FIs took into account the national distribution of women, infants and children in the Program. To further balance the assignments of FIs, purchase sequences were assigned for each of the three basic types in each state.

Compliance buys

The compliance buy methodology had two components--one whose primary purpose was to capture data on the vendor-initiated abuse on "safe" buys; i.e., purchases of WIC approved brands and sizes of all items on the FI in the full quantity indicated. The second component captured data on the vendor's response to investigator-initiated abuse in a subsample of buys.

Under the study's design, one third of the sample vendors received five safe compliance buys, one third received three safe compliance buys, and one third received four compliance buys: three safe buys and one buy containing a substitution. A total of 4,623 buys were conducted during the summer of 1991. Safe buys 1, 2, and 3 were used to estimate the approximate total Federal dollar loss due to overcharging and rate of overcharging, and the incidence of other abuses the vendor initiated in the absence of any investigator-initiated abuses. Data from those vendors subjected to a five-buy series were used to determine if short-term familiarity with the participant increases the dollar amount or incidence of abuse. The investigators assigned to conduct a four-buy transaction attempted an unauthorized food purchase on the fourth buy.

THE FINDINGS

This study of a national probability sample of retail WIC vendors who had participated in the Program for at least 12 months found the magnitude and incidence of overcharging to be considerably lower than had been anticipated based upon prior studies of smaller scale which used a different methodological approach.

ESTIMATES OF THE PREVALENCE AND MAGNITUDE OF OVERCHARGING AND UNDERCHARGING

Based on the first three safe compliance buys that were carried out for each of the sample vendors during the summer of 1991, an estimated 7,564, or 22 percent of the authorized vendors participating in WIC for at least 12 months would have committed an overcharge violation on at least one of the three buys. These vendor overcharges are estimated to have resulted in a 1991 annual mischarge of $39.5 million or 1.9 percent of an estimated $2.09 billion in annualized retail redemptions based upon redemption in June and July, 1991.

The estimates also indicate that there is more overcharging among stores with between one and five registers (small vendors) than among those with six or more registers (large vendors), resulting in an estimated $6.9 million (0.5% of retail redemptions) for large vendors and $32.6 million (3.9% of retail redemptions) for small vendors.

In addition to overcharging, the survey revealed a substantial amount of undercharging. This unexpected finding was of sufficient magnitude to warrant inclusion in the analysis. Based on the results from the sample safe buys, an estimated 5,673, or 17 percent of the approximately 34,033 vendors represented in this study undercharged on at least one of the three buys. This undercharging is estimated to amount to $11.9 million--about 39 percent of the estimated annual overcharging. Data were insufficient to determine why so many vendors took this course of action or how much of this undercharging was unintentional or random. Because there was no way to estimate rates of systematic over or undercharging, references to "net" mischarging simply represents one way of presenting these data. In other situations estimates are presented as total overcharges and/or total undercharges.

In terms of vendor size, an estimated 6,052 (29%) of small vendors overcharged as compared to 1,512 (11.5%) of the large vendors. In addition, significantly more overcharging in both dollars and incidence were noted for women's and children's food instruments, than for infant coupons -- that is, $30.3 million (2.4% of redemptions) for women and children FIs vs. $9.2 million (1.17% of redemptions) for infant FIs and incidences of 5,871 (25.8% of vendors) for women and children FIs vs. 1,693 (15% of vendors) for infant FIs.

ESTIMATES OF THE PREVALENCE OF VARIOUS TYPES OF PROGRAM VIOLATIONS

Twelve WIC Program violations were investigated in an attempt to determine whether abusive vendors generally committed single or multiple offenses. It also was of interest to determine which of these identified abuses might occur most frequently.

Short-term familiarity

The study revealed that the number of violations committed did not increase for the second and third buys. This finding was consistent with the results of the test of familiarity which indicated that the prevalence of overcharging did not increase across three or five safe buys. Only 1.9 percent of all investigator-initiated substitutions were successful.

The larger estimated proportion of vendors who would commit multiple offenses was associated with stores which had one to five registers. This finding is consistent with

earlier findings that suggest that smaller stores are more likely to commit program violations.

The program violation most frequently observed was failing to ask for a WIC Program Identification Card. However, it occurred about as frequently among vendors who overcharged, undercharged or who charged correctly.

The violations identified most frequently with an overcharge (unweighted data) were failing to enter the purchase price on the FI at the time of purchase as well as any countersigning procedures.

Multivariate analyses

A series of multivariate analyses were conducted to determine if it might be possible to identify variables which are effective in distinguishing between abusive and non-abusive vendors, how best to combine the variables, and how successfully the distinction could be made. The results suggest that vendors operating stores with less than six registers who do not provide register receipts or request the participant to sign the FI before ringing up the sale are correlated to overcharging on safe buys. Variables which could be obtained without a visit to the vendor can provide a reasonable prediction of vendor overcharging.

All attempts to profile undercharging vendors using the same variables associated with overcharging were unsuccessful.

CONCLUSIONS

The purpose of this investigation was to establish a baseline from which to examine changes over time in retail vendor abuse behavior as changes are implemented to strengthen State vendor management.

The findings showed that the loss of funds due to WIC vendor overcharging on safe buys may not be as great as that originally believed. Furthermore, some specific program violations and associated dollar amounts may not be as strongly associated with abusive vendors as originally believed.

However, the study did indicate that there are a large number of vendors who appear to be systematically undercharging the program as well. Insufficient data were available to determine reasons for this phenomenon.

GLOSSARY OF TERMS

Basic buys - The first three safe compliance buys conducted for all vendor groups (see Exhibit 1.3).

Clustering - Process used during sample selection to group stores in relatively small geographical areas.

Compliance buy - An investigative technique using WIC food instruments to make covert WIC purchases at stores selected for the study. See Safe Buy and Major Substitution.

Compliance Buy Outcome Report (CBOR) - Primary data collection form used in the WIC Vendor Issues Study to report the results of compliance buys.

Draft - A negotiable food instrument that is reviewed for "reasonableness" prior to being submitted to a bank as a proxy for legal tender.

Familiarity effect - The change in the probability of a vendor-initiating a violation as he/she becomes increasingly familiar with the investigator.

Food Delivery System - One of three methods WIC State Agencies may select to provide food benefits to participants: retail purchase, home delivery, or direct distribution. Only the retail purchase method was incorporated into the study design for the WIC Vendor Issues Study.

Food Instrument (FI) - A negotiable check or voucher which may be exchanged for food by a WIC participant. Food instruments are redeemable at State-authorized WIC vendor establishment.

Food Package - A group of foods prescribed for a WIC participant and issued to the participant on one or more food instruments.

Large chain stores - Vendor establishments identified according to state-defined criteria. Definitions may vary from state to state. Study definition is six or more registers.

Major substitution - In the WIC Vendor Issues Study, the fourth buy for Group C stores in which the investigator attempts to purchase a non-WIC food item (i.e., not milk, cheese, eggs, juice, cereal, beans, peanut butter, infant formula, or any other category of WIC food) in place of one or more items listed on the WIC food instrument.

Metropolitan/non-metropolitan - Grouping according to standard Office of Management and Budget (OMB) definition of each Metropolitan Statistical Area.

Negotiable check - A negotiable food instrument that is submitted to a bank as a proxy for legal tender.

Net overcharging - Estimate of overcharging derived by subtracting any undercharging from the gross overcharging for a sequence of compliance buys.

"Not-to-exceed" food instruments - Food instruments which are preprinted with a maximum dollar value.

Other-than-large-chain-store - Vendor establishments identified according to state-defined criteria. Definitions may vary from state to state. The study used one to five registers.

Overcharging - Charging more for WIC foods received at the time of purchase than the current price for cash purchases. Overcharge for WIC foods was a result of either systematic (fraudulent) overcharging or random (non-intentional) overcharging. For the purposes of this study, out-of-stock purchases where rainchecks were issued and the investigator was charged for food not received at the time of purchase would have resulted in an overcharge.

Overlap vendor - A vendor in the study that was observed both to overcharge and to undercharge at least once during the three safe buy sequence.

Primary Sampling Unit (PSU) - A PSU is a group of one or more contiguous counties in the same state and constructed to include at least 80 vendors listed as authorized WIC vendors in summer 1990.

Redemption data - Information provided by the states with regard to either the redeemed value of a specific food instrument processed for a particular vendor or the total dollar amount reimbursed to a particular vendor for a specified time period.

Safe buy - A compliance buy in which the investigator purchases WIC approved brands and sizes of all items listed on the food instrument in the full quantity indicated. All buys except the fourth buy in Group C stores are Safe Buys.

Standard error - A measure of the average variation in a survey estimate of interest (for example, percent of vendors in a given year) across all possible random samples of a certain size that could be theoretically drawn from the target population. The standard error of the difference of two sample percents for the study was estimated as the square root of the sum of the two variance estimates.

Transaction - Another name for a compliance buy.

Undercharging - Charging less for WIC foods received than the current price for cash purchases. Dollars undercharged as a result of either systematic undercharging or a random (non-intentional) undercharge.

Vendor - A retail store authorized to accept WIC food instruments in exchange for approved WIC foods.

Vendor initiated violation - Action initiated by the vendor, to defraud or abuse the program (e.g., providing cash in exchange for a food instrument or overcharging).

Voucher - A non-negotiable food instrument which serves as a receipt for which reimbursement must be sought.

WIC - The Special Supplemental Food Program for Women, Infants, and Children, administered by State Agencies for the U.S. Department of Agriculture through annual grants.

CHAPTER 1:

INTRODUCTION

1.0 INTRODUCTION

The Special Supplemental Food Program for Women, Infants, and Children (WIC) is administered at the Federal level by the U.S. Department of Agriculture, Food and Nutrition Service (FNS). The Program is designed to serve as an adjunct to ongoing prenatal and pediatric health care by operating through a network of local institutions, including county health departments, hospitals, and other nonprofit human service organizations. Since WIC is not an open-ended entitlement Program it must operate within the funding levels provided each year by the Congress. The number of eligible women, infants, and children accepted into the Program, therefore, depends on the amounts allocated by FNS to specific States and local projects.

Food benefit provisions represent approximately 80 percent of WIC Program expenditures. Since food purchase accounts for such a significant portion of total Program costs, food delivery operations have come under close scrutiny. Over the past decade, a number of audits of the Program have provided evidence of Program abuse and unreconciled accounts.

1.1 BACKGROUND OF THE WIC VENDOR ISSUES STUDY

Study Purpose

Following findings of an Office of the Inspector General (OIG) audit in 1988, documenting considerable variability in the accuracy of the dollar amounts charged to WIC, FNS awarded a contract for the WIC Vendor Issues Study. This study was designed to examine the prevalence and magnitude of overcharging and selected types of fraud and abuse by retail vendors at the national level. National estimates of vendor abuse were based upon food price data collected through undercover investigations from a nationally representative sample of retail WIC vendors who had participated in the Program for at least 12 months. The study provides a national baseline measure of the incidence of selected types of vendor abuse and an estimate of the dollar loss to the WIC Program from retail vendor overcharging. The data from the study may be used to examine changes over time in overcharging on safe buys and certain other vendor abuses as program changes are implemented.

The WIC Program

In 1992, WIC provided supplemental food, nutrition education, and health care referrals to over 5 million low-income pregnant, postpartum, and breastfeeding women; infants; and children under five years of age. This $2.6 billion Program is administered by State Agencies through grants provided by USDA. WIC State Agencies are authorized to provide WIC's supplemental foods through three types of food delivery systems: retail purchase, home delivery, or direct distribution. Forty-eight States and the District of Columbia use the retail purchase system, which accounts for approximately 90 percent of WIC food expenditures.

In the retail purchase system, persons eligible for the WIC Program are issued a monthly food package in the form of one or more food instruments (FIs) redeemable at State-authorized vendors. FIs may be checks, drafts, or vouchers. In all cases, the FI has the type, size, and quantity of food that may be purchased written or printed on its face. Authorized WIC foods include milk, cheese, eggs, juice, cereal, peanut butter, beans, and infant formula. Retail grocers accept FIs in exchange for the authorized foods listed, record on the FI the total price of the food purchased, then submit the FI for payment.

This transaction is witnessed only by the participant and the vendor. It offers opportunity for vendor abuses such as overcharging, allowing substitutions for the prescribed WIC foods, and other offenses. One such offense is called "trafficking", where WIC participants may sell their FIs to a vendor or other person at less than the total value of the FI in order to get cash. In addition, participants can chose to purchase a partial food package or only some of the items on the FI. The opportunity then exists for the vendor to redeem the FI for the full value of the foods listed. The variety of possible vendor abuses is discussed in Section 1.5.

1.2 CURRENT REGULATORY REQUIREMENTS PERTAINING TO FRAUD AND ABUSE CONTROL

1980 OIG audit

On May 28, 1982, the Department issued regulations (7 CFR PART 246) strengthening State requirements regarding the management of WIC vendors. Previous audits of State food delivery systems by the Department's Office of Inspector General (1980)1/ had documented weaknesses in vendor monitoring, financial management, Federal oversight of the WIC Program, and Program accountability. These new requirements were intended to increase State Agency responsibility for WIC food delivery systems and prevent loss of Program funds through retail vendor fraud and abuse. The Department issued many of the requirements in the form of goals and left much discretion to the State administering agencies over their implementation. The Department recognized the diversity of the State retail systems then operating. These varied widely in the number of participants served, FI and food package design and policy, the degree of automation supporting the systems, vendor payment rules and methods, as well as the current level and kind of vendor monitoring.

States were required to implement the following new requirements by May 28, 1983:

- an on-site visit prior to, or at the time of, initial authorization of a new vendor
- periodic review of vendor qualifications to participate
- a standard Statewide written agreement with each authorized vendor which incorporated, at a minimum, nineteen Federal compliance requirements
- implementation of a system to ensure that each redeemed FI could be identified with the vendor who redeemed it
- implementation of a system to identify, monitor, and sanction high-risk vendors
- an increase of the maximum disqualification period for abusive vendors from one to three years
- review of FIs for vendor overcharges and errors

1/USDA, Office of Inspector General, "Food and Nutrition Service, Special Supplemental Food Program for Women, Infants and Children: Food Instrument Delivery System," Audit Report No. 27623-1-Ch, October 1, 1980.

- submission of an annual report summarizing the results of the State's representative and high-risk monitoring activities.

States retained substantial flexibility in the methods and procedures they could use to meet these requirements. Two examples illustrate this flexibility as it pertains to the current study. First, while States were required to implement systems to identify high-risk vendors and monitor them, the regulations did not prescribe any particular type of investigative activity (e.g., vendor audits or undercover WIC compliance buys). Thus, while the States were required to have the capability to conduct compliance investigations, they were not explicitly required to do so. Second, while the regulations required States to implement systems to identify vendors as high-risk for fraud or abuse, they did not specify the methods or frequency of risk detection activities.

1.3 PREVIOUS RESEARCH ON WIC VENDOR ABUSE

In addition to issuing new regulations, FNS made other efforts to improve vendor management. The following studies on WIC fraud and abuse control were conducted and the results disseminated to all State Agencies.

The 1982 "WIC State Agency Guide to Vendor Monitoring and Fraud and Abuse Control" was the result of a research effort to better define the WIC vendor fraud and abuse problem and to identify "best practices" for effective, low cost vendor management. The study revealed "a diversity of vendor monitoring practices with little or no evidence of effectiveness" as well as a "commitment of substantial resources to [vendor management] that often was in excess of apparent loss levels and rarely accompanied by the recovery of equivalent funds or the removal of 'problem' vendors."2/

Vendor-initiated offenses

A review of State case studies led the researchers to the development of a taxonomy of WIC vendor fraud and abuse control strategies. Several types of actual, or potential, vendor-initiated offenses were identified, including:

- substituting food
- exchanging cash for food instruments (i.e., trafficking)
- charging higher prices or surcharges for WIC transactions
- charging participants cash in addition to the food instrument
- charging WIC for more food than was sold
- dealing in stolen, forged or counterfeit FIs.

Risk detection strategies

The following types of risk detection strategies were recommended:

- development of "high risk" vendor profiles

2/Arthur W. Burger and Stephen Stollmack, "WIC State Agency Guide to Vendor Monitoring and Fraud and Abuse Control," ANALOGS, Inc., Grant #FNS 59-3198-0-96, April 1982, page 1.

- vendor-specific ADP reports
- participant complaint hotline
- site visits
- compliance purchases
- random sample of FIs
- citizen and vendor tip-offs
- Food Stamp investigations.

The study also presented statistical models for the analysis of vendor redemptions to detect overcharges and other suspected abuse but did not provide estimates of the frequency or magnitude of loss due to vendor abuse.

ARVA Study

FNS also funded the "Applied Research on Vendor Abuse Project" (ARVA),3/ which was conducted by the Massachusetts Department of Public Health. This study included the development and testing of a number of automated high-risk indicators of vendor abuse as well as a method to rank vendors according to risk potential. The study identified nine indicators of potential abuse whose effectiveness was later tested through a series of compliance purchases. The ARVA project contributed valuable information about high-risk vendor detection by confirming the effectiveness of several statistical indicators proposed in the earlier study. Like its predecessor, however, the ARVA project was not designed to provide national estimates of the frequency or magnitude of vendor abuse.

While the ARVA study was being completed, the State WIC vendor managers in the FNS Southeast Region wrote and distributed "The WIC Papers."4/ This "Best Practices" handbook recommended practices found to be successful in those seven States in the areas of vendor authorization criteria, training and monitoring, risk identification, uniform sanctions, and cooperative strategies with the Food Stamp Program. "The WIC Papers" contained the results of a retrospective study carried out by four States concerning 72 stores investigated in Fiscal Year 1984. The study confirmed the relationship between certain high-risk indicators and the likelihood of abuse, particularly vendor overcharging. Although characteristics such as store type and location (urban/rural) were reported, they cannot be said to be representative of abuse patterns nationally (or even Statewide) since vendors were selected for investigation because they were thought to be abusive and therefore did not constitute a representative sample of all vendors.

3/Massachusetts Department of Public Health, "The ARVA High-Risk Vendor System: A Technical Assistance Guide" (Applied Research on Vendor Abuse Project), Grant #FNS-59-3198-1-117, June 1985.

4/The Merchant Coordinators of the Southeast Region, "The WIC Papers: Best Practices for Merchant Management," Atlanta, GA., December 1985.

1988 OIG audit

A second OIG audit5/ was released in June 1988 and provided additional aggregate data about WIC vendor monitoring systems. The OIG audit used compliance buys to determine the incidence of, and Federal dollar loss from, overcharging by WIC retail vendors in a preselected sample in six States. A compliance buy is an undercover investigative method used to evaluate vendor compliance with procedures for cash transactions. The audit documented considerable variability in the accuracy of the dollar amounts charged to WIC. However, strict probability sampling methods were not used in selecting the sample of WIC retail vendors for compliance buys. All large chain stores and stores located outside of metropolitan areas were excluded from selection. Half the vendors in metropolitan areas that were within the audit population were selected by simple random sampling. The remainder were selected judgmentally on the basis of a review of FI redemption patterns, using statistical indicators of fraudulent redemption claims. The audit findings, therefore, were not statistically projectable to the entire WIC vendor population and could not be used to establish a defensible national estimate of the incidence of vendor fraud and abuse.

FNS sponsored studies

Based on the requirements of the May 1982 regulations, FNS began collecting aggregate data on State vendor management activities.6/ This included the number of vendors authorized in each State and the number of representative and high-risk visits conducted by WIC State agencies. These reports, however, did not yield nationally comparable data. Variations in State criteria for identifying overcharges and conducting monitoring visits precluded meaningful comparisons among the States and an unclear national picture. Most importantly perhaps, the annual reports did not require information on the magnitude of loss involved in the overcharging violations reported.

Another FNS sponsored study, "WIC Vendor Management Systems and Practices,"7/ was published in December 1990. It contained survey information about a wide variety of State vendor management practices as they existed in Fiscal Year 1987. The study population (48 States and the District of Columbia) coincides with the WIC Vendor Issues Study population. While the study did not yield data directly related to the incidence and magnitude of loss due to vendor abuse, it did summarize a number of conditions important to the execution of the present study. Unfortunately, while the study's findings were helpful in gaining a general understanding of the wide variations in State vendor management practices, profiles of individual State practices were excluded. Some important findings related to overcharging and other violations were:

- Overcharge edit policy -- Thirty-nine States reported that they flag FIs for potential overcharges. They delineated 29 methods for doing so. Ninety-three percent of the States reporting that they used some method to identify overcharges did so by comparing redemption claim amounts with current price data. The definition of "current price data" varied widely, from monthly shelf price to a periodic extrapolation of price data from redemption data. (Less than half of the

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5/USDA, Office of Inspector General, "Food and Nutrition Service Special Supplemental Food Program for Women, Infants and Children: Vendor Monitoring and Food Instrument Delivery Systems," Audit Report No. 27661-2-Ch, June 1988.

6/USDA, FNS, "Vendor Activity Monitoring Profile (VAMP) Reports," 1983-1989.

7/Professional Management Associates, "Final Report. WIC Vendor Management Systems and Practices," December 1990, pages ix - xi.

States collected vendors' specific shelf prices for WIC foods on a quarterly or more frequent basis.) The study did not attempt to evaluate the effectiveness of the various methods used to identify potential overcharges nor determine how much money was recouped from vendors in States using the various methods.

- Identification of high-risk vendors -- In identifying high-risk vendors, 90 percent of the States depended heavily on tips, complaints, and the review of statistical indicators. Many of the States' statistical indicators, however, were not automated and were not used to identify high-risk vendors.

- High-risk investigation -- When high-risk investigations were undertaken, 74 percent of the States used compliance buys as at least one of their methods of investigation. Eighteen percent conducted an audit. Among the 36 States that reported conducting compliance buys, "safe buys" (in which the investigator purchased only eligible foods as specified on the FI) and buys which tested for minor and major substitution were the custom. Only 11 States reported conducting compliance buys to test for exchanging FIs for cash.

- Corrective action -- There was considerable variation in the type of offense for which States disqualify vendors from the Program and in the length of time for which a vendor is disqualified. For example, most States considered exchanging cash or credit for WIC food instruments to be a violation; however, the length of the disqualification period associated with the violation varied between 2 and 36 months.

- Factors affecting abuse control activities -- Approximately half of the States cited a lack of staff and resources as inhibiting vendor fraud and abuse control. Twenty-five percent of the States identified a lack of automation or inadequate automation as a factor. Twenty-two percent indicated that the administrative funds available were inadequate to do all that was needed to improve fraud and abuse control efforts.

- Staffing and costs -- Most vendor management staff time was expended on routine FI processing and vendor monitoring. Most States had a centralized vendor management system with routine operational activities conducted at the local level. Only three States did not have a "vendor manager" staff position. The position, however, might typically be part-time or have other responsibilities.

WIC fraud and abuse case studies

In June 1991, "The WIC Files" was published by the Vendor Managers in the Southeast Region.8/ This compilation of selected WIC fraud and abuse case studies provided narrative examples of undercover compliance investigations and WIC price and stock audits. These studies illustrated the known range of WIC vendor (and participant) abuse and the methods States use to detect, investigate, and sanction abusive vendors. While the authors did not claim statistical validity for their observations, they noted some trends among State practices as well as abusive vendors. They estimated from their experience

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8/The Vendor Managers of the Southeast Region in cooperation with the Florida WIC Program, "The WIC Files: Case Studies of Vendor Audits and Investigations in the WIC Program," Tallahassee, FL., June 1991.

that between 4 and 12 percent of vendors were seriously abusive.9/ Nationally, over a period of several years, States had been identifying (through the required FNS annual report) between 9 and 10 percent of vendors as high-risk. The authors noted that the incidence of abuse was probably less than 10 percent in States with a high proportion (75%) of WIC redemptions through supermarkets and major chain stores and in States with a five-year history of compliance enforcement (i.e., targeted high-risk investigations and sanctions). Their observations led them to believe that systematic overcharging was the most prevalent serious violation among small to medium-sized independently-owned and operated stores. Substitution of related but ineligible foods was the most common abuse noted among all store types.

1.4 PROPOSED REGULATORY CHANGES REGARDING VENDOR MANAGEMENT

In December 1990, the Department published proposed regulations aimed at further strengthening State vendor management.10/ Among the many proposed changes was a requirement for States to conduct compliance buys or audits on 10 percent of their authorized vendors each year, a requirement for each State with more than 50 vendors to employ a full-time vendor manager, and a requirement for States to identify vendor overcharges effectively and take action to collect those amounts. In addition, the proposed rules required specific, national vendor authorization criteria, more standardized sanction systems, and again required increased accountability over FIs. In contrast to the 1982 food delivery regulations, many of whose requirements were stated as goals, the 1990 proposal made explicit the standards, methods, and frequencies for many of the changes being required. These regulations were still "proposed" as of February 1, 1993.

1.5 WIC VENDOR ISSUES OBJECTIVES AND RESEARCH QUESTIONS

As noted previously, the WIC Vendor Issues Study was designed to develop a national probability sample of retail vendors and estimates of the prevalence and magnitude of overcharging and selected types of fraud and abuse by examining vendor activity. It used covert compliance investigations of vendor behavior as its primary data collection mechanism to develop a statistically valid, reliable baseline of Program abuse by WIC vendors. The data collected in this study are intended to be compared with similar information collected at some time in the future after the implementation of the proposed food delivery system regulations. The study has two primary objectives:

Study objectives

- establishing a methodology using compliance buys to determine a statistically valid national estimate of the magnitude and prevalence of vendor abuse in WIC retail distribution systems

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9/Ibid., page 55.

10/7 CFR Part 246, "Special Supplemental Food Program for Women, Infants and Children (WIC): Proposed Rule," Federal Register, Vol. 55, No. 250, December 28, 1990.

- applying that methodology to conduct compliance buys and establish a baseline measure of vendor abuse.

Study research questions

Collection and analysis of compliance buy data were guided by a set of research questions corresponding to each of the study's primary and secondary objectives and 16 corollary research questions, as listed in Exhibit 1.1. The study protocol consisted of a series of complex activities, the scope of which had never been attempted in past research of WIC vendor abuse. This section contains a discussion of the scope of analysis available to answer each of these research questions. The last section in this chapter presents an overview of the study.

One of the first steps undertaken in the study was the identification of types of possible WIC vendor abuse (Research Question 1). Exhibit 1.2 lists these vendor or participant-initiated abuses and whether the abuses could result in Federal dollar loss, vendor dollar gain, or nutritional compromise. During the study design phase, the researchers met with FNS and the Study Advisory Panel in order to narrow the types of abuse which could reasonably be included in the first national estimate of dollar loss (See Appendix I). It was decided that overcharging abuse should be the focus of the loss estimate. The incidence of major substitution also was considered to be important and was to be tested in a portion of the vendors. (The question of nutritional loss resulting from vendor abuse is outside the scope of this study, but is addressed in a general fashion.)

For the purposes of the study, overcharging took several forms. It could occur at the register or after the transaction had been completed. A vendor may overcharge by:

- inflating prices for each WIC food or a subset of foods when calculating the total price,
- adding an additional charge to the total price of the WIC foods,
- charging a set price for each FI type, or
- charging a price just below the maximum value for the FI.

Research questions 2, 6, and 9 addressed the effect of "familiarity" on the incidence and dollar loss due to abuse. Conflicting theories exist as to whether a vendor needs to become familiar with a WIC participant (or in this case, an investigator posing as a participant) before he/she begins to commit abuse. On the one hand, overcharging represents a participant-passive abuse. That is, the participant has nothing to gain from vendor overcharging and does not actively participate. Vendors can overcharge the Program without the knowledge, consent, or active participation of the WIC participant. On the other hand, abuses such as substitution of non-food items or selling FIs require participants to take an active role. In this situation the participant-initiated activity may encourage an escalation in abuses committed by a vendor as he/she becomes familiar with the participant. Program administrators in States which have active investigative and sanction practices generally believe that vendors must decide that the participant is NOT an investigator prior to allowing participant-initiated abuse. Case studies both dispute and confirm this theory. Other instances suggest that certain low volume vendors (particularly rural vendors) know most or all of their customers. Any stranger shopping in the store will excite curiosity and perhaps suspicion.

Exhibit 1.1

Item - Objective Matrix

STUDY OBJECTIVES	RESEARCH QUESTIONS
Primary Objectives	
1. Establish a methodology that uses compliance buys to determine a nationally representative estimate of the magnitude and prevalence of vendor abuse in WIC retail distribution systems:	
• Identify the types of Program offenses committed by WIC vendors	1. What types of Program offenses occur that result in dollar losses or compromise WIC nutritional objectives?
• Determine the number and type of compliance buys that will be performed for each vendor	2. Is a vendor more likely to commit Program offenses when he is familiar with a WIC Program participant?
• Determine the type and content of the food instruments that will be used in the compliance buy.	3. To what extent do the format and content of food instruments vary among the WIC State Agencies that use the retail purchase system?
2. Applying the methodology, conduct the required compliance buys and establish a baseline measure of vendor abuse to assess the effectiveness of the proposed regulations to curb the vendor abuse problem. A later procurement will be issued after implementation of the proposed regulations to establish a second measure of vendor abuse:	
• Determine the proportion of WIC vendors that commit Program offenses	4. With what frequency are various types of WIC Program offenses committed?
	5. Which types of WIC vendors commit the most common offenses?
	6. Are Program offenses more likely to occur in transactions with WIC participants a vendor recognizes?

Exhibit 1.1 (Continued)

Item - Objective Matrix

	• Determine the contribution of overcharging to Federal dollar loss	7. What is the estimate of total Federal dollar loss from overcharging?
		8. Is dollar loss greater among WIC vendors of particular types?
		9. Is dollar loss from Program offenses greater in transactions with WIC participants a vendor recognizes?
	• Identify the aspects of the WIC transaction that are most vulnerable to Program offenses	10. Is overcharging or substitution more likely to occur when certain types of food instruments are used?
<u>Secondary Objectives</u>		
3.	Identify the characteristics of WIC vendors found to be abusing the WIC Program. Knowledge of these characteristics will be instrumental in developing high risk vendor profiles.	11. What are the store types, location, and food instrument characteristics of the WIC vendor population?
		12. Are there any characteristics of vendors found to be abusing the WIC Program that distinguish them from vendors who did not commit abuses?
4.	Compare those vendors receiving compliance buys with the list of high risk vendors identified by State Agencies. Examination of the indicators of the high risk identification systems that identify those vendors found to be abusing the WIC Program will be useful in improving high risk identification systems.	13. What indicators do WIC State Agencies use to identify high risk vendors?
		14. Are the vendors in the compliance buy sample who committed Program abuse also considered high-risk by WIC State Agencies?
		15. Have WIC State Agencies identified high-risk vendors which were selected in the compliance buy sample but did not commit Program abuses?
		16. Are the characteristics of WIC vendors found to be committing serious Program offenses the same as those of vendors identified as high-risk by WIC State Agencies' high-risk identification systems?

Exhibit 1.2

Types of Vendor Abuse

TYPE OF ABUSE	INITIATED BY:	FEDERAL DOLLAR LOSS:	VENDOR DOLLAR GAIN:	NUTRITION COMPROMISE
OVERCHARGING:				
Prices charged in excess of shelf prices	V	YES	YES	YES
Charging for foods not received by participant	V	YES	YES	YES
Charging participants surcharges for WIC foods	V	NO*	YES	YES
SUBSTITUTION:				
Of similar, but unallowed foods	P or V	YES or NO	YES or NO	YES
Of dissimilar, unallowed foods	P or V	YES or NO	YES or NO	YES
Non-foods	P or V	YES	YES	YES
FAILURE TO ENTER* PURCHASE PRICE	V	YES or NO	YES or NO	YES
EXCHANGE OF CASH OR CREDIT FOR FI	V or P	YES	YES	YES
ACCEPTING OUT-OF-DATE FIs	P	NO	NO	YES
PURCHASING LESS THAN THE FULL FOOD PACKAGE	P	NO	NO	YES

* Expected to be associated with overcharging, not necessarily a client-initiated "abuse"
V = Vendor
P = Participant

Exhibit 1.2 (Continued)

Types of Vendor Abuse

TYPE OF ABUSE	INITIATED BY:	FEDERAL DOLLAR LOSS:	VENDOR DOLLAR GAIN:	NUTRITION COMPROMISE
FAILING TO MAINTAIN ADEQUATE STOCK OF WIC FOOD	V	NO	NO	YES or NO
DISCRIMINATING AGAINST WIC PARTICIPANTS	V	NO	NO	YES or NO
FAILURE TO REQUEST FOR WIC ID	V	NO	NO	NO

V = Vendor

Familiarity

In this study, questions about familiarity were addressed through a compliance buy methodology consisting of a series of safe buys at each selected vendor (Exhibit 1.3). In the familiarity analysis, the result of each compliance buy is treated as an independent estimate of abuse. To examine the hypothesis that vendors under investigation delay committing more serious offenses until they have seen a participant in their store several times, the estimate of Federal dollar loss due to overcharging that occurs on the first compliance buy was compared to the estimates of Federal dollar losses that occur on each successive buy. Data relating to this issue are found in Appendix IV.

As noted in Exhibit 1.3, vendors selected for the study were divided into three roughly equal groups, A, B, and C. The first three safe buys among all groups were used to estimate the incidence and magnitude of overcharging. The fourth and fifth safe buys for Group A were used to test for familiarity. The fourth buy among Group C vendors was used to establish an estimate of the incidence of major substitution allowed by vendors who had, by then, three previous "safe" buys to become familiar with the "participant." Major substitution was defined as a compliance buy in which the investigator purchased all but one item listed on the WIC food instrument in the exact quantity specified. A non-WIC food item was to be substituted for a WIC item of approximately the same dollar value.

Variation in Food Instruments

Research questions 3, 10, and 11, which deal with FI and vendor characteristics, will be addressed very generally. The FIs used in the WIC Program vary widely in terms of their content and format. The regulations prescribe the maximum quantities of food to be issued according to the category of participant being certified, i.e., women, infants, or children. Within these three categories other refinements such as age or condition of the applicant pertain. Individual States may develop policies which further limit the quantities of forms of food allowed. Some States' FIs allow the purchase of a single food; others allow the purchase of a group of foods. Most States print a maximum allowable value on the FI; a few do not. Some FIs are "vouchers" which are submitted directly to the State agency for payment, usually in batches; others are checks which may be deposited directly into the vendor's bank. Drafts are similar to checks except the fiscal intermediary is required to review this redeemed price for "reasonableness."

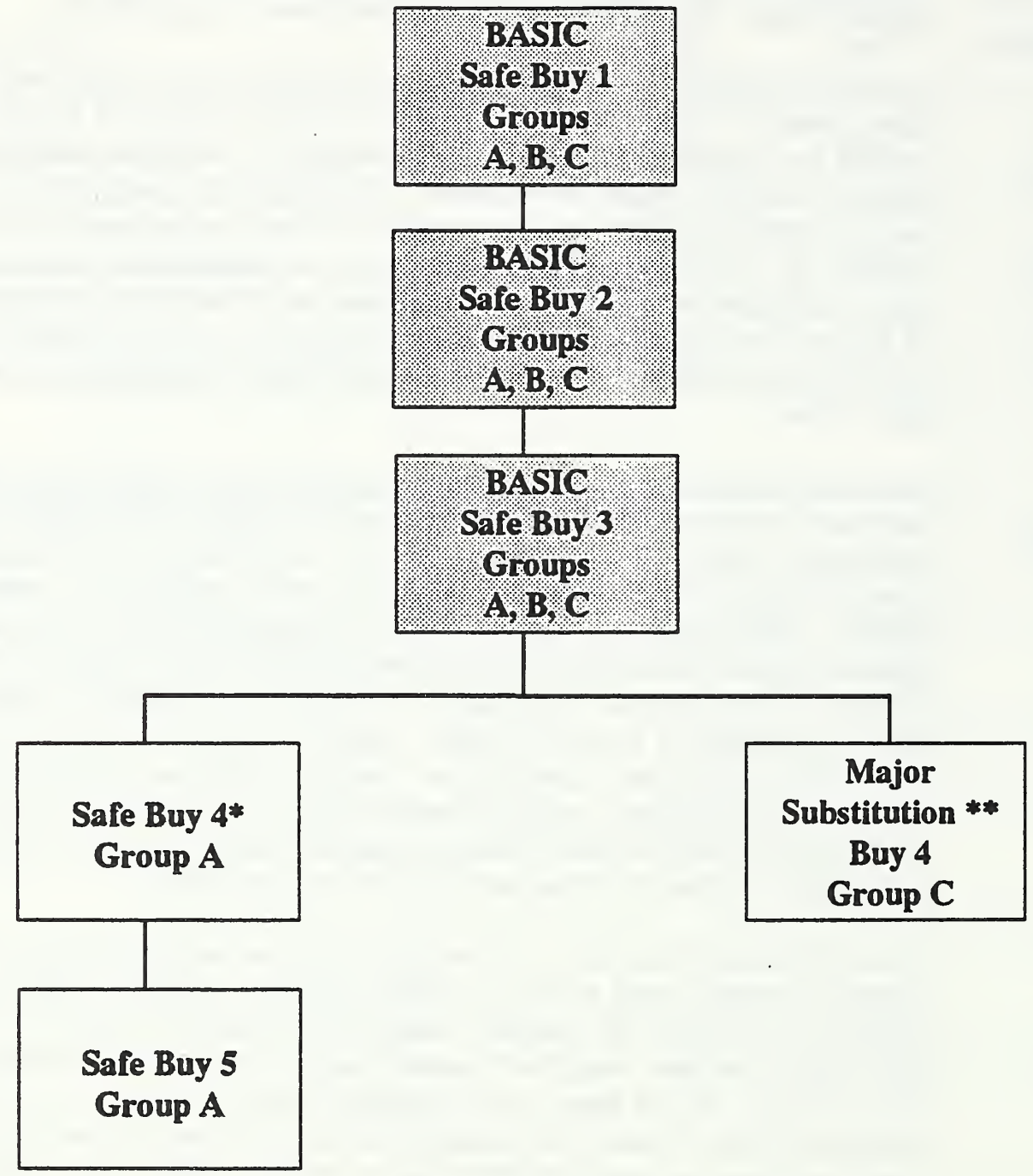
FIs may be issued "manually" or generated by the State's automated food delivery system. "Manual" vouchers tend to have a higher maximum allowable value than computer-generated FIs because the possible contents of the manual FIs may vary considerably. Some States also issue "preprinted" manual vouchers which contain commonly prescribed food packages. A few States operate vendor specific systems, i.e., at certification, the participant selects a vendor from among those authorized and the food instruments issued to the participant are made payable to that vendor only. Most States operate a system in which the participant can choose among any authorized vendor in the State at the time of purchase.

Vendor classification

The vendors selected for the study were divided into two categories, chain stores and other-than-chain stores, also referred to as non-chain stores. Large chain stores were identified as those outlets with six or more cash registers. This broad categorization was necessary because: 1) some States do not classify vendors by type of store; and 2) those States which do, do not use an industry-standard system. Vendors with less than six registers were placed in the non-chain store group. (Pharmacies, military commissaries,

Exhibit 1.3

Compliance Buy Methodology for the WIC Vendor Issues Study



▒ -- Represents three basic safe buys completed by a single investigator at all vendor establishments and used to estimate rates and levels of mischarging.

* -- The same investigator completed all five safe buys in the sequence to help test for familiarity.

** -- The same investigator completed three safe buys and one substitution in the sequence to attempt a major substitution.

and "convenience" stores also were classified as non-chain stores. Military commissaries were ultimately dropped from the sample due to the difficulty of gaining access during the Persian Gulf War.) Register-related information was collected during the buys (e.g., number of cash registers and use of registers with automatic scanning devices) and was used to help characterize vendor types most likely to commit abuse (see Chapter 3, Tables 3.1 - 3.8).

Frequency of violations

Research question 4 concerns the frequency of commission of various types of WIC abuse. In addition to the findings reported about overcharging and major substitution, certain other limited information is available from the Purchase Price Records completed for each buy (further described below in the Study Overview section of this chapter). For example, investigators were instructed to purchase the size and amount of foods listed on the FI using a "safe" buy protocol; however, this was not always possible if a vendor was out-of-stock of these WIC foods. If the vendor were out of stock of an item, the buy was conducted for whatever specified WIC foods were available and a code was entered on the purchase record to denote why the item was omitted.

Likewise, certain information about the frequency with which vendors provide receipts to WIC participants was also collected and recorded on the Purchase Price Record section of the data collection instrument. If a receipt were provided to the investigator, the price information from the receipt was recorded on the Purchase Price Record. If a receipt were not provided, no "receipt price" information was recorded. (The information from the receipt were used during quality control to verify the correct price of any item purchased with a WIC FI. Current shelf price was verified by other means described below.)

As mentioned earlier, selected stores were classified as chain stores or non-chain stores based upon information provided by each State agency. For research question 5, estimates of the magnitude and prevalence of overcharging and the incidence of major substitution are reported by number of registers as opposed to Chain and Other-Than-Large-Chain stores.

Estimate of dollar loss

Question 7 concerns the estimate of total Federal dollar loss from overcharging. Although overcharging may come about in several ways, the definition of overcharging is constant in the study. An overcharge was considered to have occurred if the vendor charged more than the current shelf price for the WIC items actually purchased with WIC FIs. In the study, the accuracy of current shelf price data for the foods purchased was critical. Each item's price was required to be verified on each buy. The verified price and the method used to verify the price was recorded in the Purchase Price Record of the Compliance Buy Outcome Report. The verified prices were totalled and compared with the redeemed amount of the FI as submitted by the vendor for payment.

The total Federal dollar loss from overcharging is understood to mean the total estimated dollar amount lost during one year among all authorized retail vendors. Although in Fiscal Year 1991 the Federal WIC food grant was approximately $1.8 billion, WIC's actual retail redemptions (pre-rebate) for food could exceed this figure. This is possible because of two situations: 1) some State legislatures appropriate additional monies for the WIC Program, and 2) States receive other monies from infant formula manufacturers (and other food manufacturers) which are rebated directly to State agencies and used to reduce the average food cost to WIC. In the study design, overcharging was accounted for by estimating an annualized retail redemption amount for each vendor in the WIC vendor universe.

In addition to intentional overcharges, it was anticipated that vendors would commit errors in ringing up a WIC sale which led to unintentional over- and under-charges. As the study progressed it became apparent that making a correction for unintentional mischarging would not be as simple as originally believed due to a large amount of apparently deliberate undercharging. Additional analyses were required to provide insight into what appeared to be a form of systematic undercharging by some vendors.

In response to research question 8, dollar loss is reported in terms of number of registers. Response to question 12 is also reported in terms of number of registers rather than Chain and Other-Than-Large-Chain Stores.

High-risk vendors

The indicators used by State agencies to identify high-risk vendors (research question 13) were requested from each State. Response was incomplete and varied from State to State. An attempt to analyze this information was unsuccessful.

After all compliance buys were completed, States were asked to supply lists of high-risk vendors that they identified for Fiscal Year 1991. This information, which was necessary to address Research Questions 14 and 15, was aggregated across all States in the sample and compared to the list of vendors in the sample who committed Program abuse. The number of States providing information proved to be too small to perform the required analyses.

The objective of Research Question 16 was to compare the characteristics of vendors found to be committing serious Program offenses to the characteristics of vendors identified as high-risk by the States' high-risk identification systems. Such an analysis was not possible because not all States had such information available and those that did were different enough to prevent comparisons across States.

The analyses which follow address two basic questions: 1) the national estimate of the magnitude and prevalence of abuse, and 2) the effect of a vendor's "familiarity" with the WIC participant on the vendor's propensity to abuse the Program.

1.6 STUDY DESCRIPTION

A full description of the study methodology is presented in Chapter Two. It includes details concerning major contractor and State steps taken to complete the study and evolve the compliance buy methodology. Minutes from a meeting of the WIC Vendor Issues Advisory Panel, the WIC Vendor Issues study team and representatives of the Food and Nutrition Service which was held to provide technical and practical guidance on key issues in study design and implementation are included in Appendix I.

CHAPTER 2:

STUDY METHODOLOGY

2.0 STUDY METHODOLOGY

Reliable estimates of the dollar loss to the Federal government due to vendor abuses and the number of vendors that commit abuses required that the data collection methodology approximate the behavior of WIC participants as closely as possible. This was accomplished through the use of experienced investigators trained to conduct covert transactions who were able to simulate the behavior of target store clientele.

An extensive investigator training Program was designed and conducted for all senior investigators (Detailed information about the investigators and training effort is presented in Appendix III). Senior investigator training included conducting actual buys in both low- and high-risk vendors in the vicinity of the training site, as well as other written exercises to ensure knowledge and skills required for the data collection effort had been acquired. Special emphasis was placed on the importance of conducting the buys in a manner not unlike that of a WIC participant in order to avoid attracting attention. Specifically, they were cautioned against requesting receipts, questioning prices, etc. These specially trained 19 senior investigators hired and trained the remaining 139 investigators locally.

Data collection instrument

The primary data collection form, referred to as the Compliance Buy Outcome Report (CBOR), was designed to capture transaction data (Appendix II). Its "Purchase Record" grid was designed to capture the following data for each food instrument used in the study:

- the quantity, size and item description of WIC food to be purchased (as specified on the food instruments)
- the quantity, size and item description for each item actually purchased
- receipt price data (if receipt given by vendor)
- unit and total shelf price data
- a price code indicating the method used to verify the shelf price.

The Purchase Record grid also contained space for recording each purchased item's status, i.e., an eligible item purchased in the size and quantity specified on the Food Instrument (FI), reason for item omitted, and/or item substitution codes.

Verified, totaled shelf price data was compared with the vendor's redemption price for each FI to determine whether overcharging occurred and the dollar value of overcharging's contribution to Federal dollar loss (research questions 4 and 7). The cost of each item purchased with WIC FIs was verified in several ways:

- the price was marked on the item
- the price was posted and observed

- a second investigator obtained the price by making a cash purchase
- the price was obtained through a ruse telephone call.

Other data documented various types of Program abuses, and investigator comments concerning any miscellaneous observations which might be useful in interpreting the open-ended questions in the instrument.

Assignment of FIs

The FIs used by investigator in completing the assigned compliance buys were matched to those used by each local agency and typical food packages for the simulated participant. The number and type of FIs required to complete the planned series of buys in each store was determined on a State-by-State basis. In requesting FIs, States were asked to provide the most commonly used food package for pregnant women, infants six months of age, and children over two years of age. At the time FIs were requested from the States, the names of WIC participants and/or proxies had to be provided so that the FIs could be issued. As buys were assigned and FIs received, a record was maintained for each sampled vendor containing the number and type of buy(s) to be performed, the FI serial number(s) to be used on each buy, and the printed maximum value of each FI.

Foods purchased by the investigators were donated to various charitable organizations. A record of the dispensation of these items was made on the CBOR by the individual conducting the compliance buy.

Completed CBORs were reviewed by the investigator and forwarded to a designated field office where they were reviewed, logged in, copied, and forwarded to the data coordinating center for further processing.

2.1 STUDY DESIGN

Prior to selecting vendors for the WIC Vendor Issues Study it was necessary to develop a sample frame as one was not available from FNS. This required obtaining lists of authorized vendors from each of 47 states.11/ These lists, which varied in format and accuracy, were cleaned and merged prior to drawing the study sample. The resultant frame consisted of 43,353 vendors; 16,909 of which the states had classified as large chain stores (LCS) and 26,444 of which had been classified as other than large chain stores (OTLCS).

Monthly redemption amounts were not reported for approximately 8 percent (3,468) of the 43,353 vendors. Quarterly and yearly amounts were also not reported for this group. These missing dollar volume vendors were later assigned a value of $1.00.

Sampling plan

Vendors were selected for the study using a two-stage probability selection [Primary Sampling Units (PSUs), then vendors within PSUs]. For the purpose of this study, the continental United States was divided into sixty strata of roughly equal size, where total WIC redemptions by vendors was the measure of size. Each stratum was comprised of one or more primary sampling units (PSUs). A PSU was defined as the WIC vendors

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11/Comprised of 48 contiguous states, plus Washington, DC = 49, minus two non-retail distributions states (Mississippi and Vermont) = 47. The Indian state agencies, which comprise about 2 percent of WIC participation, were excluded.

contained in a group of one or more contiguous counties in the same State. Each PSU was constructed to have at least 80 vendors listed as authorized WIC vendors in summer 1990. From each stratum, exactly one PSU was sampled, and from that PSU, on the average 20 vendors were selected to receive compliance buys. Exhibit 2.1 graphically depicts the sample design. A detailed description of the sampling plan for this effort is contained in Appendix V.

Final sample size

The sampling plan resulted in selection for study of vendors in 30 states, and included 277 major chain stores and 1,167 non-chain stores for a total initial sample of 1,444 vendors. In selecting the initial sample, a drop off rate of approximately 15 percent was expected due to store closing, blown undercover procedures, or other reasons. The final sample size was 1,205 vendors which corresponded to a drop off rate of about 16.6%. The 1,205 vendors in the sample weighted up to 34,033 vendors nationally. This shortfall is not uncommon in studies of this type as lists provided at one time may fail to take into account drop-ins and drop-outs by the time the study actually begins. There may also be clerical errors in that vendors' names may be inadvertently repeated and the names of others left out. These and other sample frame problems are universal ones in trying to match the definition of the desired target population for the study to a real-world list of who might be eligible, regardless of the data collection method.12/ It is also standard procedure not to adjust for out-of-scope cases. In this case, it would have required gathering of additional information from states concerning ingroup counts. Since the emphasis in the study was to estimate abuse rates rather than vendor totals, no ratio adjustment was made at this point to force these initial weights to add to 43,353.

The within PSU sampling methods provided an average of twenty vendors per PSU, after accounting for an expected sample loss of 15 percent. The sampling procedure incorporated an oversampling of other than large chain stores relative to large chain stores to ensure being able to test the long standing hypothesis that small to medium sized "independent" vendors abuse the Program at higher incidence than major chain stores. The overall sampling rates for these groups were set so they did not vary by more than 3:1.

To allow for the possibility of a dropout rate of larger than 15 percent, an additional (reserve) national probability sample of vendors was selected. As it turned out, some of this sample was needed. Due to the non-availability of FI's from all States except New York, the supplemental sample needed was selected from New York. The weight assigned to the New York sample respondents reflected the additional sample selected there.

2.2 ASSIGNMENT OF FOOD INSTRUMENTS

The content of the food packages for each buy at each sample vendor was designed to satisfy three analytic objectives:

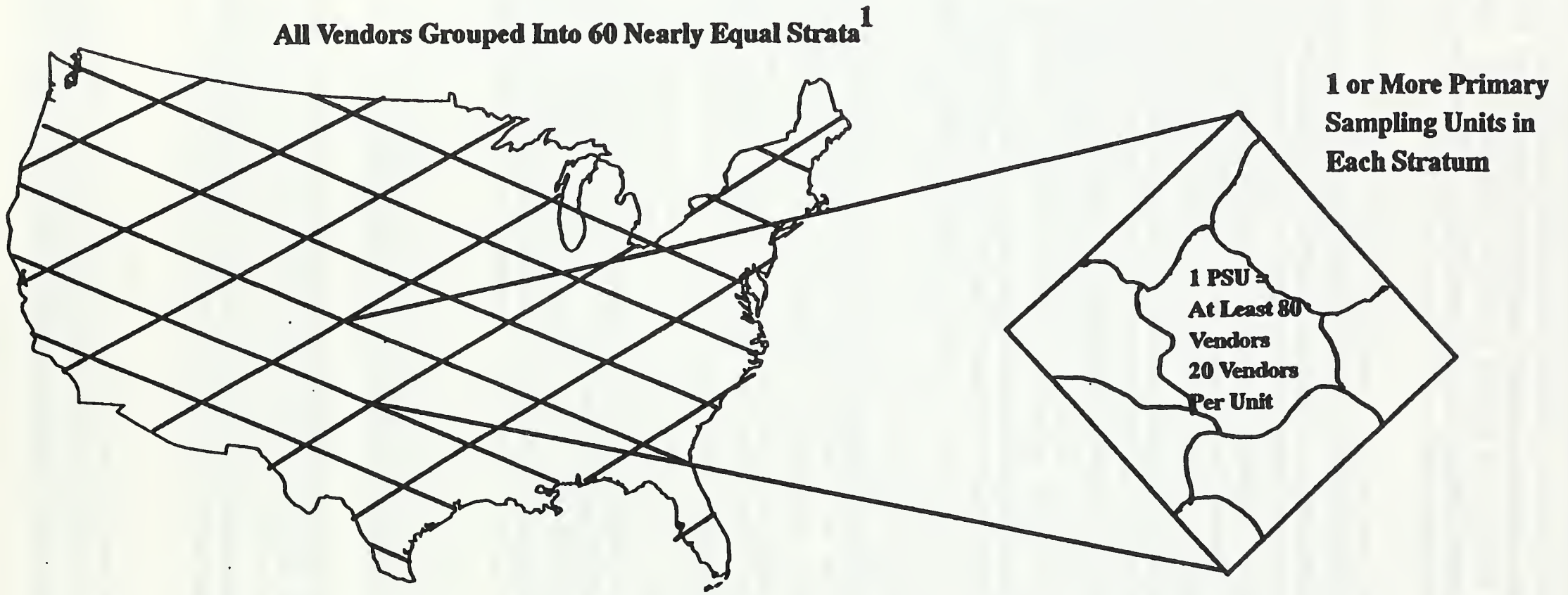
- Estimation of the proportion of the vendors in the WIC Program who practice fraud and the dollar amount of the redemptions involved

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12/Aday, LA "Deciding Who will be in the Sample." In: Designing and Conducting Health Surveys, San Francisco: Jossey-Bass Publishers, 1989. pp. 93-94, 128.

Exhibit 2.1

Sampling Plan Overview



[1] Stratum Definitions Follow State and County Boundries.

- Examination of the relationship between vendor abuse and vendor familiarity with the WIC client (number of times the client has shopped at the store)

- Estimation of the frequency with which vendors permit major substitution for an approved food item.

FI Assignment process

The assignment of FIs took into account the national distribution of women, infants and children in the Program. Data supplied by FNS indicated that women comprised 23 percent of the WIC participants, infants 33 percent, and children 44 percent. Since the retail dollar value of food packages for infants greatly exceeds that for women and children, it was also necessary to ensure that all three packages were fairly represented in the sample. November 1990 national participation data were used to fulfil this requirement.

To simplify the assignment process, nine groups, each representing 11 percent of the population, were created (see Exhibit 2.2). In each State there were two groups of women, three groups of infants, and four groups of children for total of nine groups. Using the FIs provided by the states, four food packages were defined for each of the three types of FIs in each state. These food packages, which defined food items to be purchased on the compliance buys, typically contained only one food instrument. However, for some states, two or more FIs were contained in the packages defined for one or more of the FI types. Four "instrument-order sequences" for assigning food packages to buys were then developed and added to the assignment scheme so that the same food package was not always used as Buy 1 (see Exhibit III.1). The assignment sequence was varied so that approximately one-quarter of the investigation in each WIC category in each PSU began with a different food package. Vendors were then randomly assigned to these sequences.

The desired representation of WIC categories (nine participant groups) and food instrument orders (4 buys per vendor) required 9 x 4 or 36 separate assignment groups. Stores were assigned a "treatment condition" by giving them one of the 36 randomized categories. With a repeating pattern of 36 assignment numbers, the distribution of Women, Infants and Children in the study was proportional to the national distribution and the different types of FIs were equally assigned in each of the four buys.

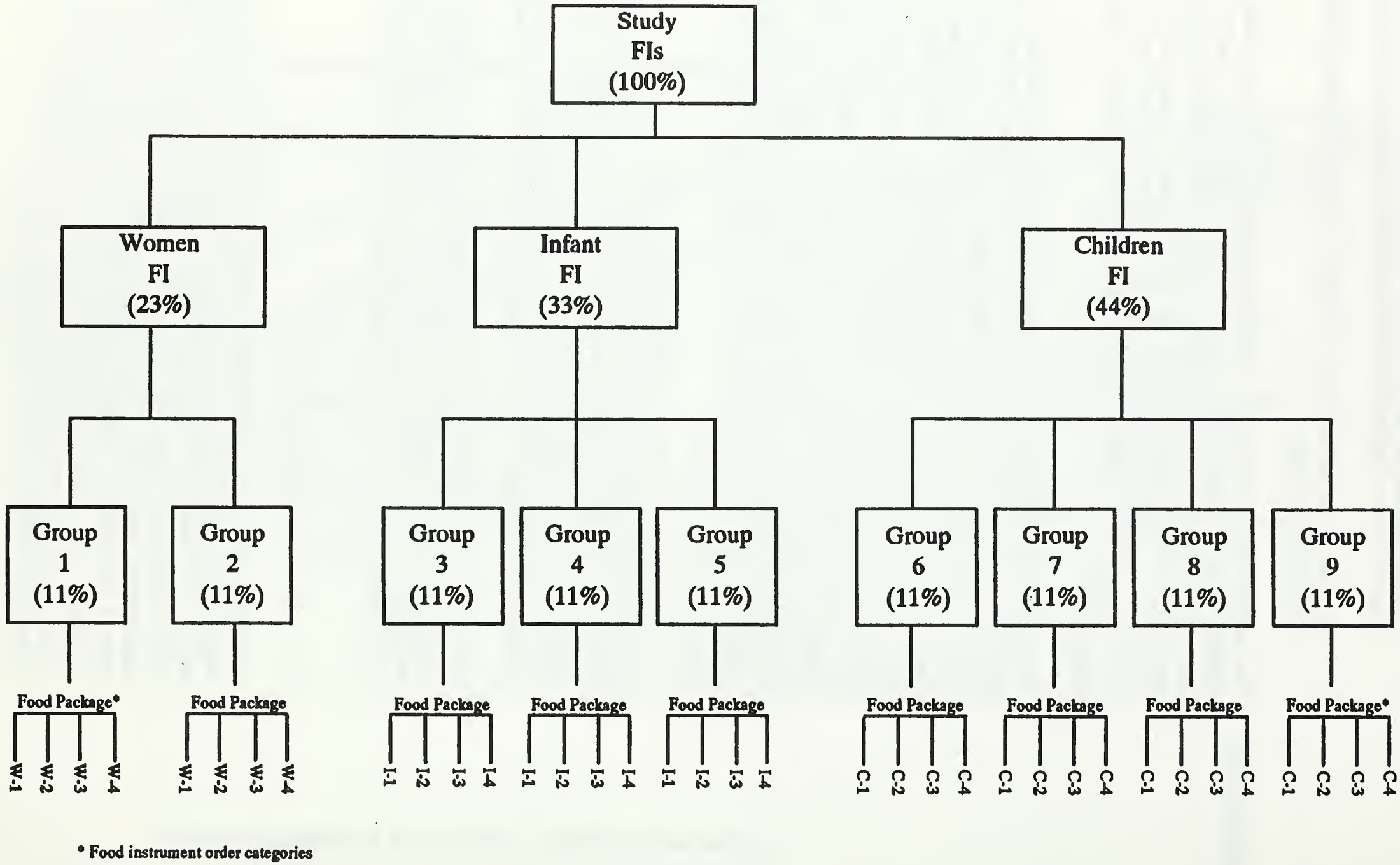
In the case of Group A Vendors (where there were five buys), the fifth buy repeated the FI sequence used in the first buy. Similarly, in the case of Group B Vendors (where there were only three buys), the smaller number of buys did not affect the distribution of FIs. In these cases, the fourth food instrument in each sequence was not used.

2.3 BASIC SAMPLING RATES

In devising the overall sampling rates, allowance was made for the expectation that there would be attrition from the sample during data collection. It was assumed that about 15 percent of the selected vendors would be out of business or no longer participating in the WIC Program and about five percent of vendors would not be included for various reasons even though they were still participating in the WIC Program. Therefore, to obtain a final sample of approximately 1,200 vendors an initial sample of 1,444 vendors was drawn. The final sample contained 1,205 vendors; thirty six of which were assigned a zero weight due to the fact that they were closed or no longer WIC authorized vendors at the time compliance buys were being conducted.

Exhibit 2.2

Assignment of Food Instruments



* Food instrument order categories

2.4 COMPLIANCE BUY METHODOLOGY

The compliance buy methodology had two components--one whose primary purpose was to capture data on the vendor-initiated abuse and second, in a subsample of buys, to capture data on the vendor's response to investigator-initiated abuse.

A distinction was made between vendor- and investigator-initiated abuses because it is possible to present a WIC vendor with purchases in which the investigator is in compliance with the Program and those in which the investigator is not in compliance. It was decided that in either event the vendor has opportunities to abuse the Program and an estimate can be made of the incidence of the abuses initiated by the vendor. Because there are no data on the extent to which WIC participants fail to comply with the Program, it is not possible to estimate dollar losses associated with their failure to comply. Investigator-initiated abuses, therefore, were viewed as "treatments" to which vendors were exposed. The frequency and extent to which participants voluntarily omit food items is also unknown, and no such "partial" buys were included in the study.

The following paradigm for compliance buys was used (see Exhibit 1.3):

BUY 1: All items purchased in the appropriate quantities for full sample of 1,200 vendors.

BUY 2: All items purchased in the appropriate quantities for full sample of 1,200 vendors.

BUY 3: All items purchased in appropriate quantities for full sample of 1,200 vendors.

The sample was subsequently divided into three groups:

BUY 4A. All items purchased in the appropriate quantities for a one third systematic random subsample of large chain stores and other than large chain stores in each PSU to yield a subsample of 400 vendors.

BUY 5A: All items purchased in the appropriate quantities for a one-third systematic random subsample of large chain stores and other than large chain stores in each PSU to yield a subsample of 400 vendors.

BUY 4C: Substitution of an unauthorized food for a WIC food item in a similarly selected subsample of 400 vendors.

Under this design, one third of the vendors in the sample were to receive five compliance buys, one third receive three compliance buys and one third receive four compliance buys. Two types of compliance buys were performed:

- Safe Buy. A safe buy is a compliance buy in which the investigator purchases all items listed on the WIC FI used in the compliance buy in the exact quantity specified.

- Major Substitution. Major substitution in this study is the fourth buy in which the investigator attempts to purchase a non-WIC food item (i.e., not milk, cheese,

eggs, juice, cereal, beans, peanut butter, infant formula, or any other category of WIC food).

A total of 4,623 buys were conducted during the summer of 1991. Basic buys 1, 2, and 3 were used to estimate the incidence of overcharging, as well as the incidence of other abuses the vendor initiates, in the absence of any investigator-initiated abuses, and the total Federal dollar loss due to overcharging.

Test of familiarity

As noted in Chapter 1, there was interest in determining the likelihood that a vendor might delay committing a serious Program offense until he/she had seen a participant in their store several times. To address this issue the study was designed to include two additional buys; 4A and 5A. These were used in conjunction with Buy 1, 2, and 3 in one third of the sample to test if familiarity increases the incidence or dollar amount of abuse. If a familiarity effect was noted, a decision would be made as to whether or not to drop the first buy from the analysis.

The approach taken has strong internal validity as it does not rely on a spectrum of assumptions about participant-initiated abuses and behaviors. Rather, it permits an empirical examination of the interaction between major substitution and overcharging, and of the incidence of vendor compliance with participant-initiated abuse.

2.5 ESTIMATION PROCEDURES

In projecting the abuses detected up to a national estimate of dollar loss, average rate of dollar abuse detected by the sample buys was used as an estimate representative of the average dollars of abuse in all the dollars of redemptions in the store.

The quantities comprising this estimate were collected in the field or calculated after the FIs were redeemed. The dollar difference due to overcharging was defined as the difference between the redemption value as entered by the vendor on the FI and the sum of the item shelf prices of the items on the FI.

Estimating dollar loss and incidence of abuse

The national estimate of dollar loss was calculated to be the sum over all vendors of each sample vendor's annual redemptions, multiplied by the vendor's average rate of dollar abuse and final weight (see Equation V.23, Appendix V). Estimates of dollar loss for the various subsets of vendors were calculated in a similar fashion, only that the sum was over all vendors in the subset of interest, rather than the universe of vendors. The procedure originally proposed to correct for random (non-intentional) overcharging could not be used because of the magnitude and nature of the measured undercharging (Appendix VII). Therefore, estimates are presented as gross overcharges, gross undercharges, and combination of over and undercharge net amounts across all buys.

Incidence of abuse was determined to have occurred if at any time during any of the visits to the vendor an abuse was committed.

2.6 DATA ANALYSIS

The national estimate of Federal dollar loss from vendor abuse due to mischarging on safe buys was developed completely from the results of compliance buys in which the investigator complied with all requirements of the WIC transactions (safe buys). An

exploratory analysis of the impact of dollar loss from transactions in which substitution occurred is also provided. The national estimate of the prevalence and magnitude of vendor fraud and abuse will serve as a baseline measure of the incidence of Program offenses among authorized WIC vendors and the magnitude of Federal dollar loss from WIC vendor Program abuse on safe buys.

Development of the national estimate involved three major activities:

- determination of the proportion of WIC vendors that commit Program offenses
- determination of the contribution of each major type of WIC Program offense to Federal dollar loss
- identification of the aspects of the WIC transaction that are most vulnerable to Program offenses.

The incidence of fraud and abuse among WIC vendors was examined along several dimensions. To contribute to development of fraud and abuse prevention and detection methods, the national estimate of the number of vendors committing abuse was differentiated by type of abuse. There were three types of abuses committed by vendors that were detectable through compliance buys, and resulted in dollar loss and nutritional compromise: overcharging, substitution, and trafficking. Only overcharging and substitution were investigated in this study. Overcharging was committed by either charging the WIC Program for WIC food at a price that was higher than its shelf price the day a FI was accepted or by charging the WIC Program for food that was not provided to WIC participants (includes rainchecks and out-of-stock items).

Types of abuse

The types of abuses that vendors commit, the methods that are used, and the time of occurrence are summarized below:

- recording the purchase price on the FI at the time of purchase - during the transaction
- failing to record the purchase price on the FI at the time of purchase - after the transaction
- Altering the purchase price on an FI - after the transaction.

Vendors may also overcharge the Program by writing a purchase price on an FI, for any arbitrary amount, after the transaction. Overcharges of this type were not distinguishable from errors, or carelessness in observing Program rules.

A vendor may initiate a substitution if he/she is out of stock of an authorized WIC brand of food, or wants to promote a particular product that is unallowed. This may be done by asking a participant to accept a substitution of similar but unallowed food for a WIC food or of dissimilar unallowed food for a WIC food. They may also suggest the substitution of non-food items for a WIC food.

2.7 METHODOLOGICAL ISSUES

Previous research on WIC vendor management provided general information about the wide variety of food delivery and vendor management systems in operation. The complexity of the tasks associated with the study came to be realized only as the study evolved. Some of the major challenges are discussed below, along with how they were resolved, and their eventual effect on this study and any follow-up study which might be conducted.

Building the data base

A major task for this study was to build a data base of all authorized WIC vendors containing core information which would allow the implementation of a statistically valid sampling plan. Early in the study design all retail food delivery States were polled to determine whether the core information was available and in what format. Unfortunately, while most States had indicated that this information could be provided, only a small number of them were able to provide the data in a machine readable form.

Collecting the vendor universe data from the States took over three months. Due to numerous other problems, an additional nine months were required before data collection could begin. For example, in one large State, vendor redemption information was not available for each outlet of major chain stores; only the total for all outlets was available. One State did not have a WIC vendor roster--it used the Food Stamp Program's list of authorized vendors--and did not have any redemption information. In other States, vendors were classified using numerous methods and categories. No attempt was made to update the list during that period.

Core information

The requested core information consisted of: vendor identification number, vendor name, address, zip code, WIC volume, and store classification. All but one of the States were able to supply the information. However, the process was more difficult and time-consuming than anticipated. In most States the data were available from two different reports which had to be matched, using vendor ID number as the shared field.

Additionally, since State agencies collect WIC vendor redemption information at different frequencies and by differing methods, negotiations were required with each State to obtain individual WIC vendor redemption volume which could be considered representative of a recent period of time, i.e., around April 1990. (All States do not capture vendor redemption amounts each month, especially States using checks as FIs, due to the cost of obtaining this information.) This dollar volume was then annualized so that each vendor's appropriate contribution to the national estimate of overcharges could be calculated. Zero dollar volume vendors were assigned a dollar value of $1.00. Stores which were in scope but found to be closed or no longer authorized to participate in the WIC program were assigned a zero weight (36 vendors).

Vendor classification

No standard method for vendor classification existed among the States, necessitating that each vendor be ultimately classified as either a major chain store or a non-chain store using State-specific definitions. Several States were not using vendor classification systems at all, so vendors were manually classified by the States and/or the contractor using copies of State vendor rosters. Pharmacies/drug stores were classified as non-chain stores.

The original study design proposed that vendors in the compliance buy sample be classified by a common set of descriptors, including number of cash registers. The proposed sub-sets included 12+ registers, 6-12 registers, 3-5 registers, and 1-2 registers.

Limitations arising from small cell sizes and the relationship of this variable to whether or not the states classified a 1-2 register store as part of a large chain required that this variable be collapsed to include stores with 6 or more registers and 1-5 registers. An additional variable, 1991 redemption amounts reported by quartiles, was included.

In general, pharmacies were problematic throughout the study design and data collection phases. Historically, they were authorized to provide high-cost "special" formulas not readily available in retail grocery stores. Pharmacies may or may not stock infant juice and cereal. Since these items are often issued on the same FIs as regular infant formulas, pharmacies authorized to provide only "special" formulas would not be able to fill normal infant food packages. Once the sample was drawn, information had to be collected from each State agency regarding its policy for authorizing pharmacies (if any appeared in the sample). The presence of pharmacies in the sample also added an extra measure of complexity in the assignment of FI types, i.e., only infant packages could be assigned. In one State, a large number of pharmacies turned up in the sample which reflected the State's continuing method of providing certain high-cost special formulas. Special FIs had to be requested from the State in question in order to complete these buys.

States vary greatly in the types, number, and frequency of FI issuance. The assignment of FIs for use in each store had to be carefully planned and monitored.

Safe buys

Little is known about how participants behave during actual WIC purchases. For example, it is not known how often or under what conditions WIC participants select less than all the items listed on the FI. It is not known what percent select the most expensive item available versus the least expensive. Some State investigative strategies intentionally omit one or more items from purchases thereby allowing the vendor more "room" to overcharge. Other strategies include buying only the least expensive brands. Because these procedures can inflate the "normal" amount an abusive vendor overcharges and because we do not know how often these events occur among WIC participants, overcharge transactions in the study were limited to "safe" buys.

Prescreening

Following a review by FNS, a field operation change was necessary early in the data collection phase. This change involved a prescreening technique being used by field investigators to determine if a retailer was still operating as an authorized WIC vendor. During the investigator recruitment process the study subcontractor was provided a copy of the vendor sample, broken out by state, and was requested to provide preliminary information about the selected stores and potential "participant" names. These names were to be used to order WIC food instruments for the compliance buys. At the first investigator training session FNS expressed concern about prescreening the vendors by telephone prior to assigning them to specific investigators to determine if the vendors were operating as authorized WIC retailers. FNS felt that this procedure could have a negative effect on investigators' ability to complete the compliance buys as planned, and requested the prescreening be accomplished through drive-buys. Since the telephone procedure was modified early in the data collection phase, a relatively small number of stores were affected. Overall, the telephone prescreening did not affect ability to estimate a national rate of vendor abuse.

Manufacturer's coupon

In the process of cleaning and editing the data set it was determined that a small number of reported undercharges were the result of the vendor crediting the WIC purchase with a "manufacturer's redemption" coupon without the investigators noticing. Since register receipts were not available for all purchases, the impact of this action on other incidences of undercharging could not be evaluated.

CHAPTER 3:

DATA ANALYSES

3.0 DATA ANALYSES

The analysis of the WIC Vendor data focuses primarily on two major areas of investigation: (1) the rate and dollar amount of vendor mischarges on safe buys and (2) the types and rate of WIC vendor violations. All findings relate only to the approximately 78 percent of vendors in the 48 contiguous states who, by the summer of 1991, had participated in WIC for at least 12 months. Annualized retail WIC redemptions for these vendors were estimated to total $2.09 billion in Fiscal Year 1991.

3.1 THE EFFECT OF SHORT-TERM FAMILIARITY ON OVERCHARGING

As noted previously, it had been hypothesized that familiarity of the vendor with the participant might be related to the level of overcharges. In order to address this issue, an investigation of this hypothesis was made prior to generating the analysis tables. It was decided that if vendor overcharges were more likely to appear after the vendor became acquainted with the investigator, the first buy would be discarded from the main analysis tables.

The impact of short-term familiarity was measured by making estimates of the incidence and amount of overcharges separately by the first, second and third buys (entire vendor sample), and separately by the first, second, third, fourth, and fifth buys for one-third of the sample (the A sample). These data are given in Table IV.1 in Appendix IV. Although not the focus of the investigation of the effect of familiarity, the same estimates were made, and are included in Table IV.1, for **undercharges** since the incidence of undercharging turned out to be substantial.

The data indicate that there is no tendency for vendors to overcharge more on later buys. In fact, both the estimated amount overcharged and the incidence estimate are lowest for Buy 5 (though the overcharge levels for Buy 5 are not significantly lower than the others). Consequently, the basic (first three) "safe" buys (see Exhibit 1.3) were used in generating the main analysis tables.

3.2 ESTIMATES OF AMOUNT AND PREVALENCE OF OVERCHARGES AND UNDERCHARGES

Estimated annual overcharging

Although this study examined several different types of Program violations, the emphasis was on overcharge abuses because of their cost implications. Based on the observed overcharges on the sample buys, conducted during the summer of 1991 at WIC retail vendors participating in the Program for at least 12 months, it is estimated that the total annual overcharge on safe buys for 1991 was $39.5 million, which is approximately 2% of the total 1991 WIC food grant budget of $1.8 billion. The overcharge estimate of $39.5 million was generated from the average overcharge rate, which was not allowed to be less than zero, computed among the three safe buys for each sample vendor. This average rate was multiplied by the vendor's annual retail WIC redemptions and by the vendor's final weight, and summed across all vendors in the sample (see Appendix V for additional detail on computations).

The basic overcharge estimates are given in Tables 3.1 - 3.4 and are graphed in Exhibits 3.1 - 3.4. Table 3.1 provides an estimate, by various types of vendors, of the annualized retail Program overcharges for the sampled population (i.e., the approximately 78% of the vendors who participated in the WIC Program for at least 12 months). Table 3.2 portrays the estimated cell overcharge amounts as percents of total retail redemptions for the cells. Table 3.3 provides estimates, by various vendor types, of the number of vendors in the sampled population who overcharge the investigator on at least one of the three safe buys. Table 3.4 gives the estimated percents of vendors who overcharge, by various types. The estimated cell totals in Table 3.3 serve as the numerators of the estimated cell percents in Table 3.4.

Table 3.2 shows the percent of dollars affected by overcharging in safe buys averages 1.9 percent, varying from 0.3 to 4.7 percent depending on the subgroup of vendor and participant category considered. Table 3.4 shows that overcharging does appear to occur with some frequency as the estimated percent of vendors engaged in overcharging in safe buys average 22.2 percent, ranging from 9.2 to 34.7 percent, depending upon the subgroup considered.

As anticipated, Tables 3.1 and 3.2 indicate that there is more overcharging among smaller stores (i.e., those with 1-5 registers) than among larger stores (i.e., those with 6 or more registers): $32.6 million (3.9% of redemptions) for smaller vendors and $6.9 million (0.5% of redemptions) for larger vendors. In terms of vendor incidence (Tables 3.3 and 3.4), an estimated 6,052 (29%) of the smaller vendors would overcharge as compared to 1,512 (11.5%) of the larger vendors who would overcharge. All four of these sets of differences are significant at the 5% level of significance.13/

In addition, the results show more overcharging for the women's and children's FIs than for the infant coupons. The higher numbers for women's and children's FIs appear both on Table 3.1 and 3.2 for overcharge amounts--$30.3 million (2.4% of redemptions) versus $9.2 million (1.1% of redemptions)--and on Tables 3.3 and 3.4 for the incidence of vendor overcharging--5,871 (25.8% of vendors) versus 1,693 (15% of vendors). All four of these comparisons are significant at the 5% level, except the one for the amount of overcharges as a percent of redemptions (2.4% vs. 1.1%), which is significant at the 10% level.

13/ This significance statement refers to the standard large sample normal (or z) test of the hypothesis that two population totals or means are equal, based on independent samples. [Actually, the samples are not totally independent due to the fact that the samples of small and large stores both come from the same PSUs. However, ignoring the dependence and the correlation between the two estimates provides a test that is conservative in that it is based on an estimated standard error which tends to be larger than the actual standard error.] The standard error of the difference was estimated as the square root of the sum of the variance estimates of the two percents. For example, for comparing the estimated overcharge amounts for smaller and larger vendors (Table 3.1), the estimated standard error of the difference was calculated as the square root of the sum of squares of 8.5 and 1.7, which equals 8.7. Since the observed difference is 25.7 (i.e., 32.6-6.9), the test statistic (z-score) is 2.95 (i.e., 25.7/8.7). Since this ratio exceeds 1.96, the difference is significant at the 5% level of significance.

Table 3.1

National Estimate of the Annual Amount of Overcharging* in millions of Dollars by Retail Vendors in 1991:
Estimates Subgrouped by Type of Coupon, Number of Registers, Vendor Monthly Redemption Total, and Metropolitan Location, with Standard Errors in Parentheses

Population Subgroup	Unweighted Number of Vendors Who Overcharged**	Estimated Annual Amount of Vendor Overcharging Millions of Dollars		
		Women and Children Food Instruments	Infant Food Instruments	TOTAL
Number of Registers				
1-5	273 [862]	$24.9 (7.0)	$ 7.7 (3.6)	$32.6 (8.5)
6 or more	40 [307]	$ 5.4 (1.7)	$ 1.5 (4.9)	$ 6.9 (1.7)
1991 Monthly WIC Redemption Amount,				
Under $600	80 [307]	$ 0.9 (0.4)	$ 0.1 (0.5)	$ 1.1 (0.4)
$600-$1,999	86 [324]	$ 2.4 (0.6)	$ 2.1 (1.8)	$ 4.5 (2.0)
$2,000-$4,499	66 [259]	$ 5.5 (1.6)	$ 0.8 (0.5)	$ 6.3 (1.6)
$4,500 or more	81 [315]	$21.5 (7.0)	$ 6.2 (3.0)	$27.6 (8.2)
Metropolitan Location				
Metropolitan	189 [698]	$24.9 (7.1)	$ 6.3 (3.0)	$31.2 (8.2)
Non-Metropolitan	24 [507]	$ 5.4 (1.4)	$ 2.9 (1.7)	$ 8.3 (2.4)
TOTAL	313 [1,205]	$30.3 (7.2)	$ 9.2 (3.7)	$39.5 (8.6)

*Based on compliance buys made during the summer of 1991.
**Each number in brackets in this column is the total (unweighted) number of sample vendors, whether or not they overcharged, that were in the designated category.

Table 3.2

National Estimate of the Annual Dollar Amount* of Overcharging as a Percent of Total Redemptions in 1991:
Estimates Subgrouped By Type of Coupon, Number of Registers, Vendor Monthly Redemption Total, and Metropolitan Location, With Standard Errors in Parentheses

Population Subgroup	Unweighted Number of Vendors Who Overcharged**	Estimated Annual Amount of Vendor Overcharging As a Percent of Total Redemptions		
		Women and Children Food Instruments	Infant Food Instruments	TOTAL
Number of Registers				
1-5	273 [862]	4.7% (1.27)	2.5% (1.21)	3.9% (1.01)
6 or more	40 [307]	0.7% (0.22)	0.3% (0.11)	0.5% (0.14)
1991 Monthly WIC Redemption Amount,				
Under $600	80 [307]	4.1% (1.70)	1.2% (0.50)	3.2% (1.29)
$600-$1,999	86 [324]	2.2% (0.52)	3.9% (3.52)	2.7% (1.23)
$2,000-$4,499	66 [259]	2.5% (0.68)	0.6% (0.30)	1.7% (0.40)
$4,500 or more	81 [315]	2.3% (0.73)	1.0% (0.58)	1.8% (0.54)
Metropolitan Location				
Metropolitan	189 [689]	2.8% (0.76)	1.0% (0.56)	2.1% (0.55)
Non-Metropolitan	24 [507]	1.4% (0.36)	1.5% (0.90)	1.4% (0.42)
TOTAL	313 [1,205]	2.4% (0.54)	1.1% (0.49)	1.9% (0.42)

*Based on compliance buys made during the summer of 1991.

**Each number in brackets in this column is the total (unweighted) number of sample vendors, whether or not they overcharged, that were in the designated category.

Table 3.3

National Estimate of Incidence* of Overcharging by Retail Vendors in 1991:
Estimates Subgrouped by Type of Coupon, Number of Registers, Vendor Monthly Redemption Total, Metropolitan Location, and Method of FI Processing, With Standard Errors in Parentheses

Vendor Subgroup	Unweighted Number of Vendors Who Overcharged**	Estimated Number of Vendors Who Would Overcharge on at Least One of the Three Buys		
		Women and Children Food Instruments	Infant Food Instruments	TOTAL
Number of Registers				
1-5	273 [862]	4846	1206	6052
		(362)	(177)	(397)
6 or more	40 [307]	1025	487	1512
		(252)	(117)	(314)
1991 Monthly WIC Redemption amount				
Under $600	80 [307]	1561	371	1932
		(229)	(112)	(302)
$600-1,999	86 [324]	1502	529	2031
		(206)	(135)	(251)
$2,000-4,499	66 [259]	1246	283	1529
		(179)	(86)	(227)
$4,500 or more	81 [315]	1562	510	2072
		(239)	(126)	(298)
Metropolitan Location				
Metropolitan	189 [698]	3151	1173	4324
		(320)	(133)	(350)
Non-Metropolitan	124 [507]	2720	520	3240
		(207)	(175)	(292)
Method of Food Instrument Processing				
Check	209 [779]	3471	1164	4635
		(320)	(203)	(369)
Draft	28 [135]	625	176	801
		(296)	(98)	(366)
Voucher	76 [291]	1775	353	2128
		(304)	(80)	(345)
TOTAL	313 [1,205]	5871	1693	7564
		(371)	(221)	(435)

*Based on compliance buys made during the summer of 1991.
**Each number in brackets in this column is the total (unweighted) number of sample vendors, whether or not they overcharged, that were in the designated category.

Table 3.4

National Estimate of the Percent* of Retail Vendors Overcharging in 1991:
Estimates Subgrouped By Type of Coupon, Number of Registers, Vendor Monthly Redemption Total, Metropolitan Location, and Method Of Processing, with Standard Errors in Parentheses

Vendor Subgroup	Unweighted Number of Vendors Who Overcharged**	Estimated Percent of Vendors Who Would Overcharge on at Least One of the Three Buys		
		Women and Children Food Instruments	Infant Food Instruments	TOTAL
Number of Registers				
1-5	273 [862]	34.7%	17.4%	29.0%
		(2.71)	(2.31)	(2.13)
6 or more	40 [307]	11.7%	11.1%	11.5%
		(2.91)	(2.61)	(2.30)
1991 Monthly WIC Redemption amount				
Under $600	80 [304]	30.8%	18.7%	27.4%
		(3.94)	(4.45)	(3.07)
$600-1,999	86 [324]	24.8%	20.0%	23.4%
		(3.46)	(4.60)	(2.69)
$2,000-4,499	66 [259]	25.9%	9.2%	19.4%
		(3.37)	(2.74)	(2.47)
$4,500 or more	81 [315]	23.0%	14.2%	19.9%
		(3.21)	(3.25)	(2.57)
Metropolitan Location				
Metropolitan	189 [698]	23.8%	17.0%	21.4%
		(2.35)	(2.14)	(1.70)
Non-Metropolitan	124 [507]	28.7%	11.9%	23.4%
		(4.24)	(3.55)	(2.86)
Method of Food Instrument Processing				
Check	209 [779]	24.7%	17.1%	22.3%
		(2.18)	(2.79)	(1.74)
Draft	28 [135]	20.5%	10.6%	17.0%
		(8.28)	(7.75)	(5.62)
Voucher	76 [291]	31.4%	12.4%	25.0%
		(3.81)	(1.91)	(2.78)
TOTAL	313 [1,205]	25.8%	15.0%	22.2%
		(2.06)	(1.87)	(1.45)

*Based on compliance buys made during the summer of 1991.

**Each number in brackets in this column is the total (unweighted) number of sample vendors, whether or not they overcharged, that were in the designated category.

Estimated Incidence of abuse

Based on the three safe compliance buys that were carried out for each of the sample vendors (with a few exceptions) during the summer of 1991, an estimated 7,564 of the 34,033 Program vendors represented in this sample (i.e., those participating in WIC for at least 12) months would have committed an overcharge violation on at least one of the three buys had all Program vendors been subjected to the three experimental compliance buys.

This is not the same as saying that 7,564 is the estimated number of vendors who intentionally overcharged the Program for some of their WIC customers during the summer of 1991. In addition to sampling error, there are two reasons why the estimated number of vendors who intentionally overcharged some of their customers would differ from 7,564. First, this study was not able to separate overcharges due to random processing errors from intentional overcharges. Second, some sample vendors who do overcharge on some of their transactions, may not have overcharged on any of the three compliance buys. Though these two factors tend to affect the estimate in opposite directions, there is no basis to estimate either of these two effects from the study data.

Overcharge comparisons among vendors in the four 1991 monthly WIC redemption levels (Tables 3.1-3.4) revealed that the estimated amount of overcharges is significantly higher for the vendors in the largest redemption size class ($4,500 per month or more), as compared to any of the other three size classes (Table 3.1). However, these differences do not hold up when the overcharge amounts are converted to percents of total redemptions (Table 3.2). Also, no significant differences appear when the incidence of vendor overcharging is compared across these four monthly redemption classes (Table 3.3). When vendor incidences are converted to percents (Table 3.4), one difference is significant at the 5% level: The "Under $600" vendors overcharge rate (27.4%) is significantly higher than that of the "$2,000-$4,499" vendors (19.4%). Viewing average monthly redemption amounts as an alternative to the number of cash registers as a way to measure the size of a vendor, this difference is consistent with earlier findings that vendors with 1-5 registers have a higher rate of overcharging than do vendors with six or more registers.

In terms of metropolitan versus non-metropolitan location, the estimated overcharge amounts (Table 3.1) and number of vendors (Table 3.3) who overcharge are significantly higher for metropolitan vendors. However, these differences do not hold up when compared on a relative basis (Tables 3.2 and 3.4). Therefore, the observed differences in absolute measures appear to be a consequence of the greater number of vendors in metropolitan areas, rather than a greater propensity for vendors in metropolitan areas to overcharge.

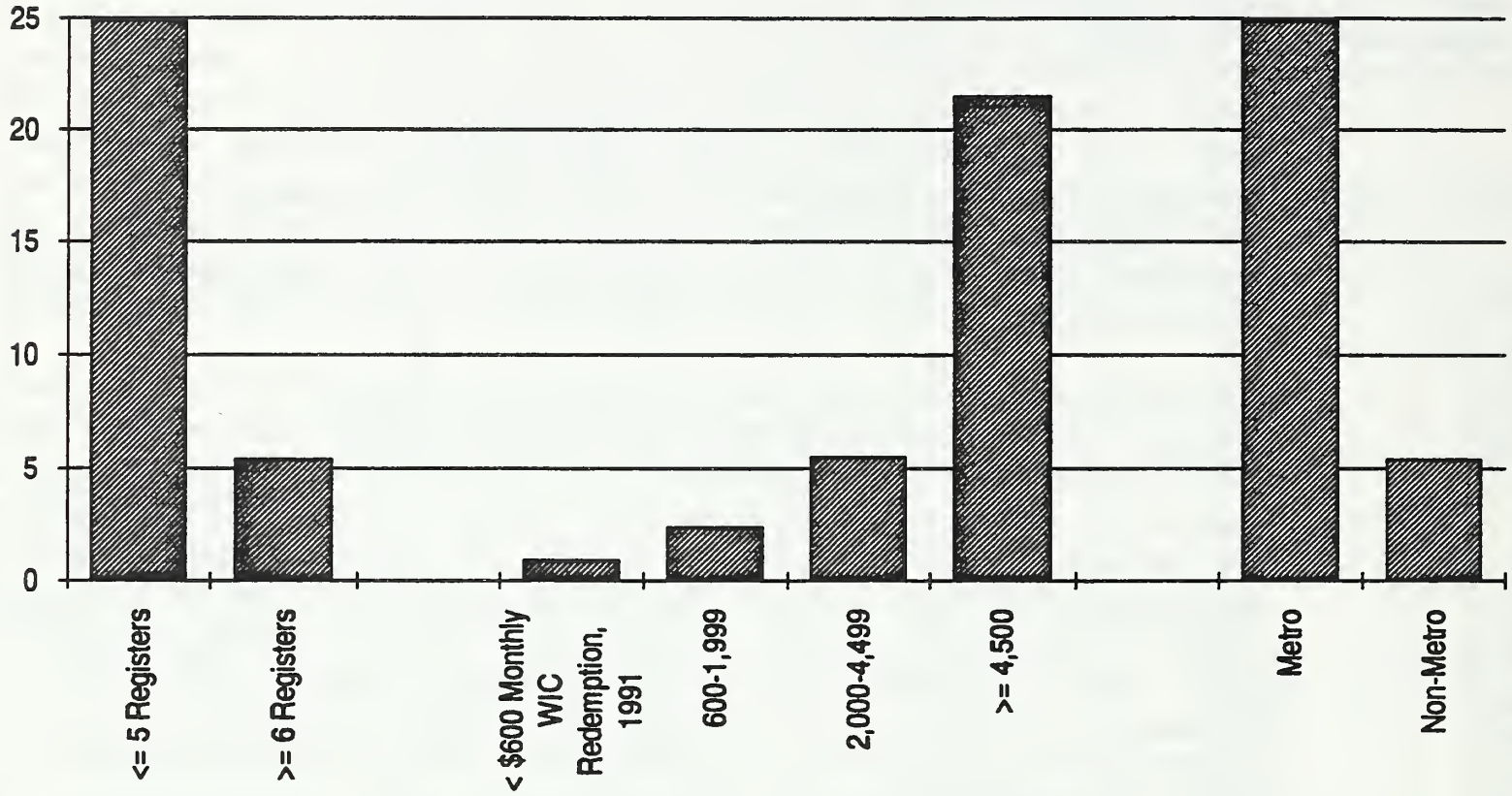
Exhibits 3.1-3.4 illustrate the overcharge comparisons presented in Tables 3.1 - 3.4. These exhibits show the subgroup comparisons of absolute amounts of overcharges (i.e., dollars or vendors) together with the corresponding comparisons of relative amounts (percents).

Estimated annual undercharging

In addition to overcharging, a considerable amount of vendor undercharging was discovered during the course of the survey. Even though estimating the amount or rate of undercharging was not part of the initial study goals, the undercharges were of sufficient magnitude to warrant their inclusion in the analysis. The estimates of the dollar annual amounts and vendor incidence of undercharging, both in absolute and relative terms, are given in Tables 3.5 - 3.8 by the same population subgroups that appear in the overcharge tables.

Exhibit 3.1

National Estimate of the Annual Dollar Amount of Overcharging by Retail Vendors in 1991:
Women and Children Food Instruments Sample



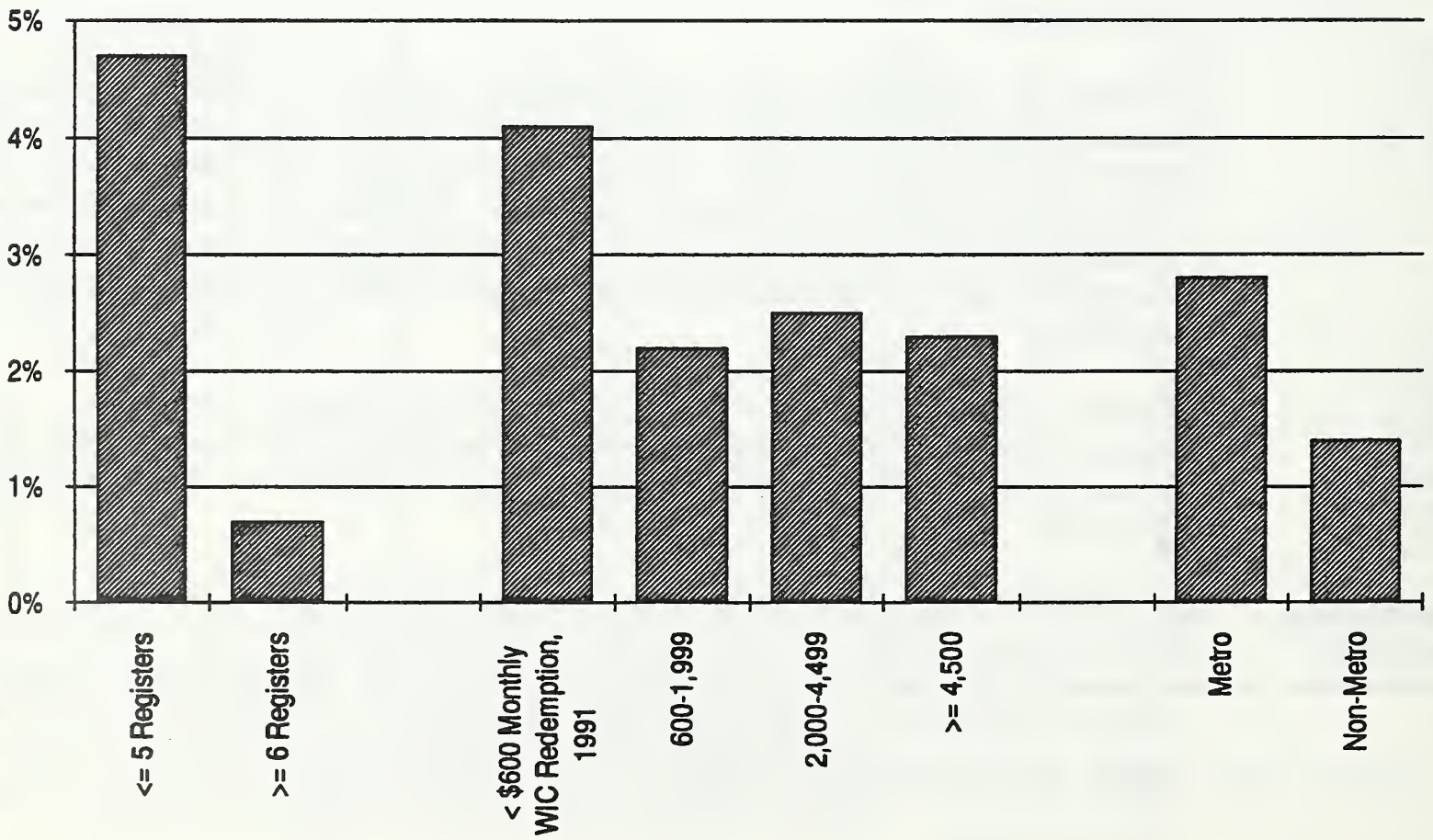
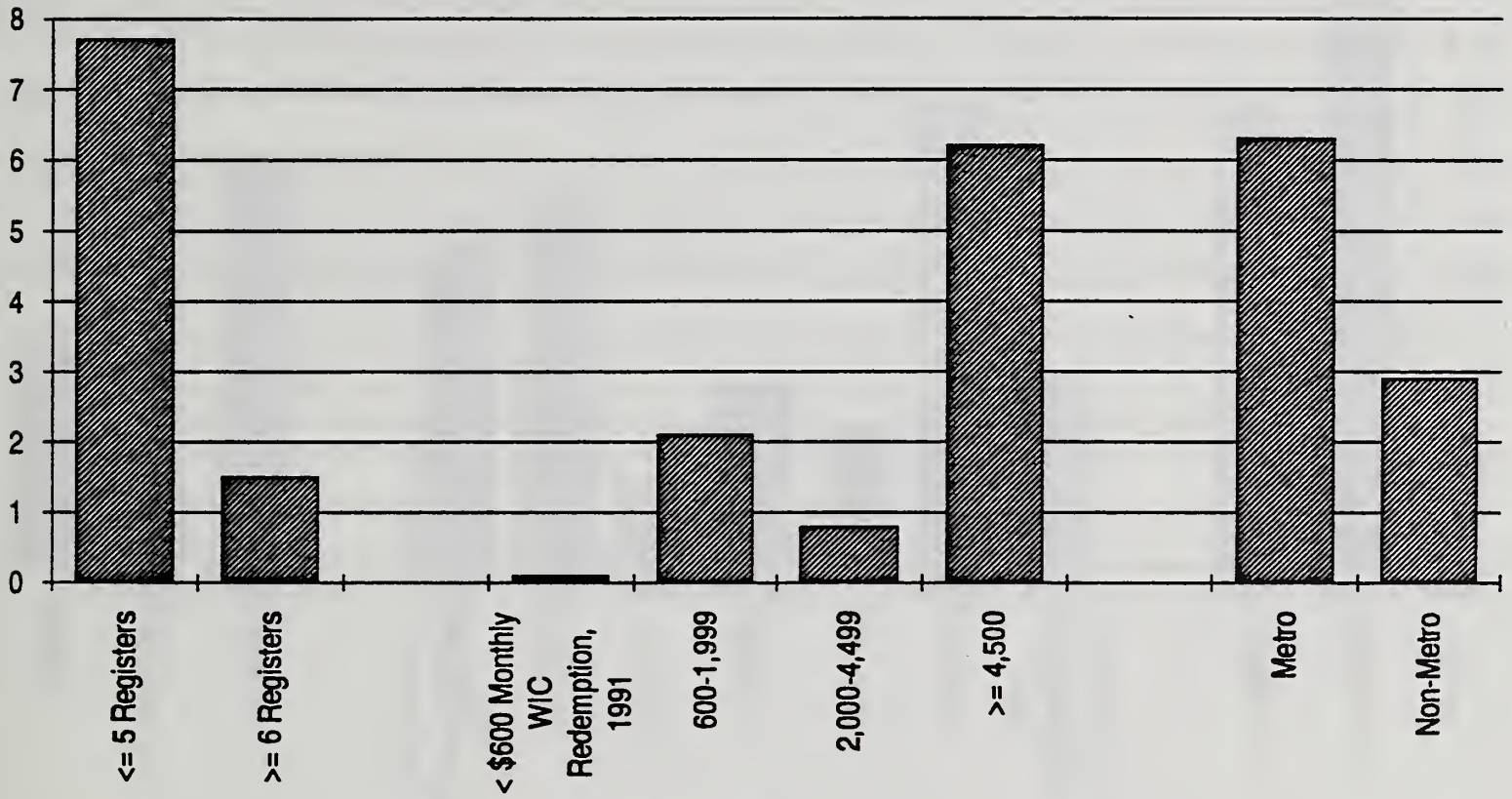


Exhibit 3.2

National Estimate of the Annual Dollar Amount of Overcharging by Retail Vendors in 1991:
Infant Food Instruments Sample



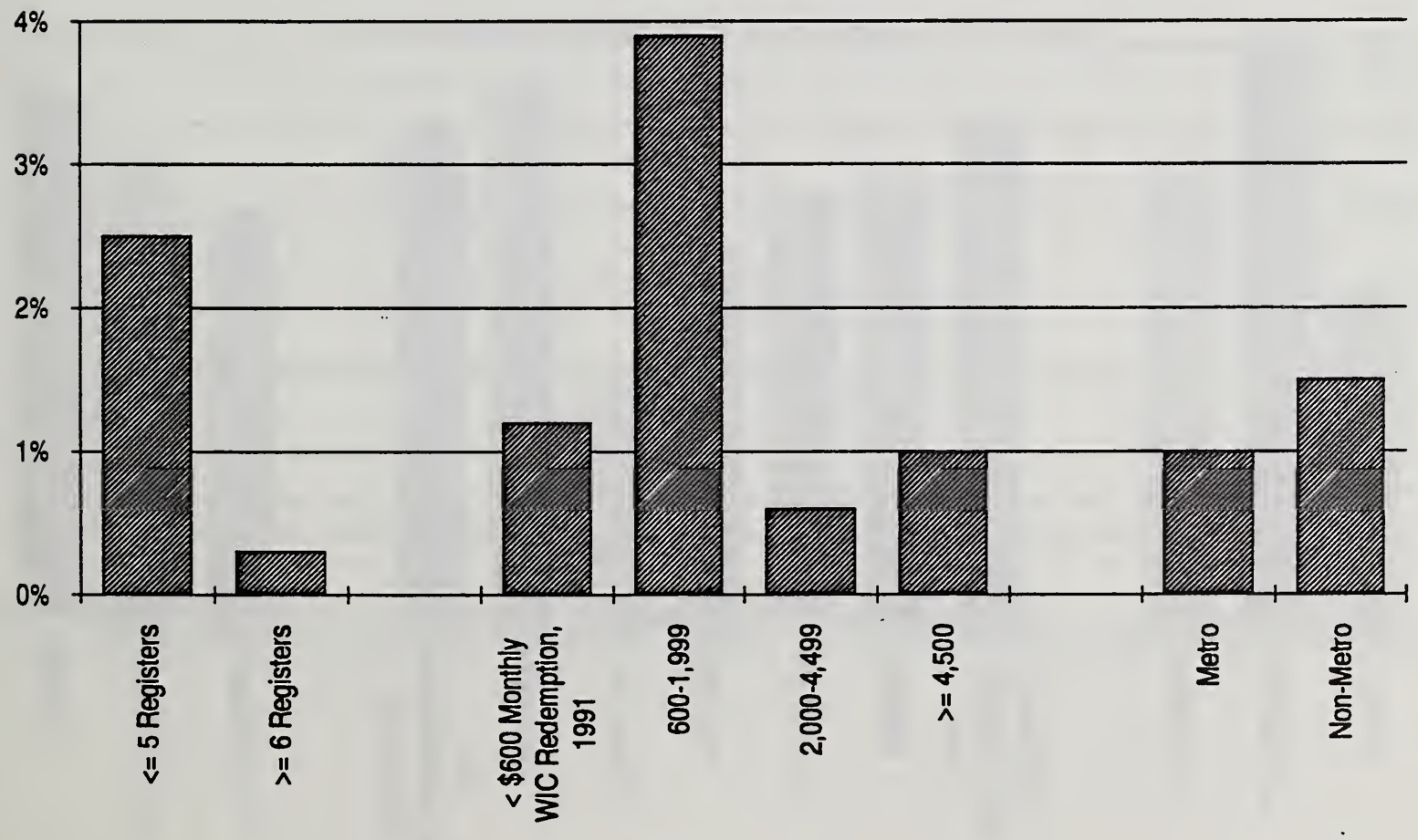


Exhibit 3.3

National Estimate of Incidence and Percent of Overcharging by Retail Vendors in 1991:
Women and Children Food Instruments Sample

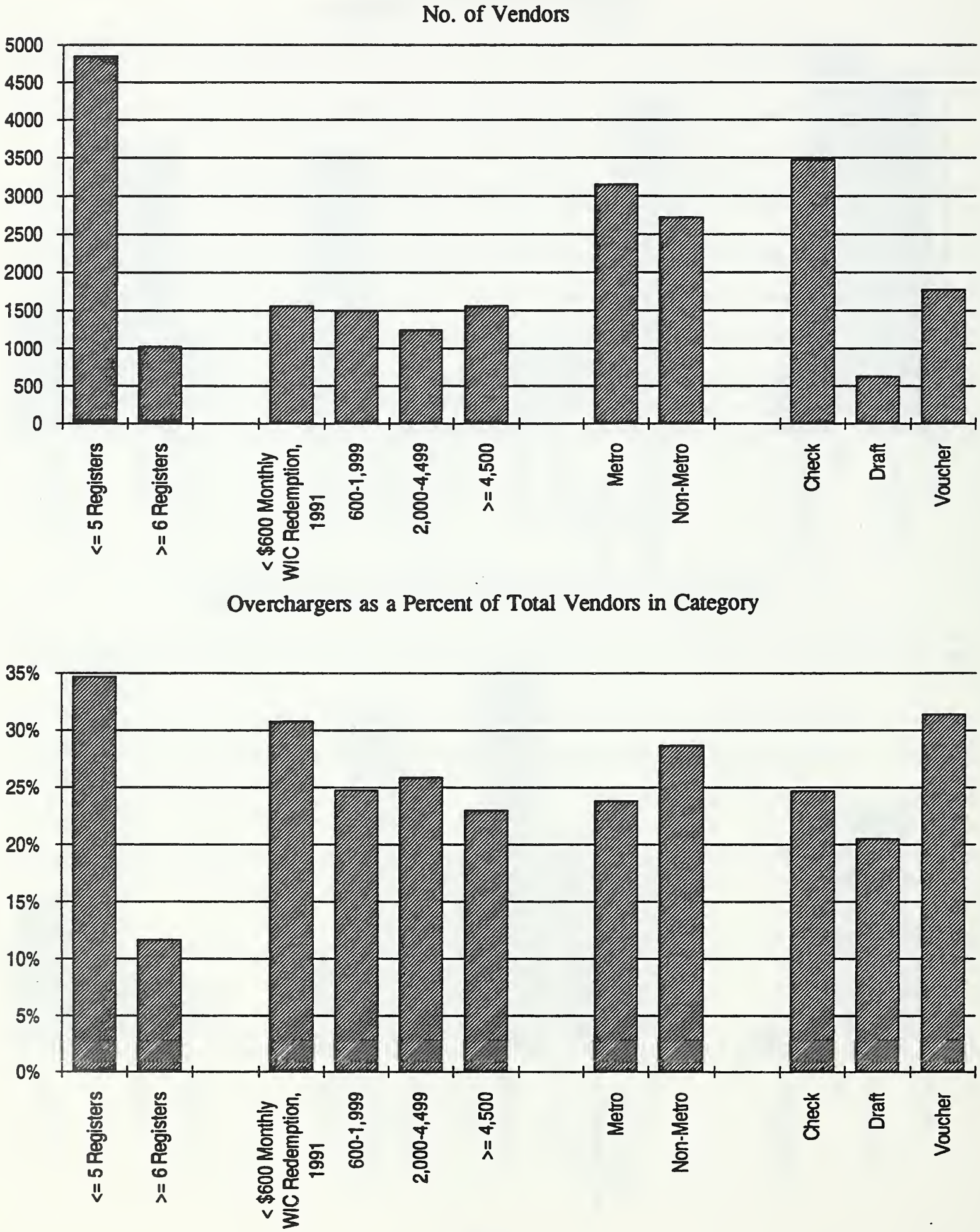


Exhibit 3.4

National Estimate of Incidence and Percent of Overcharging in 1991:
Infant Food Instruments

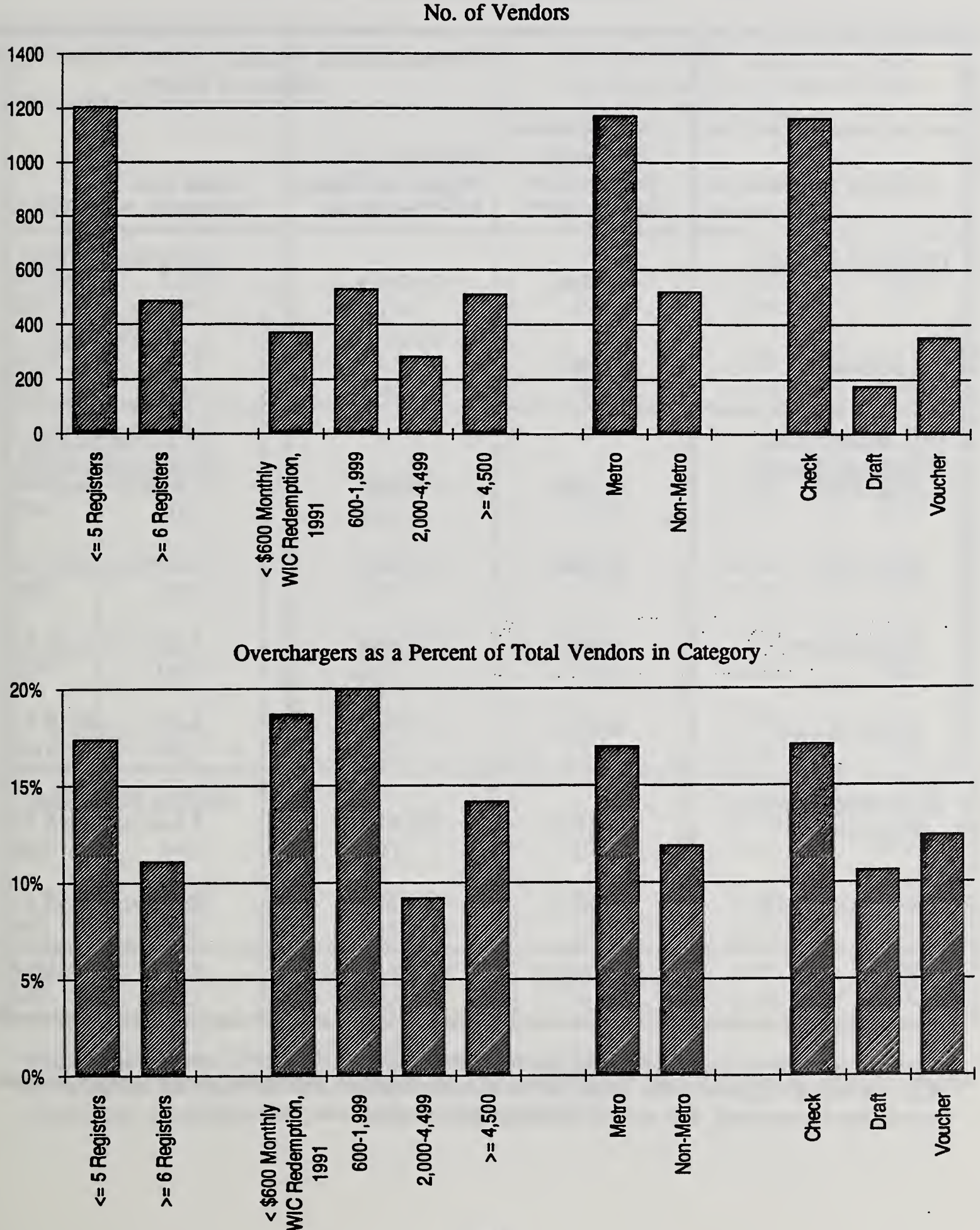


Table 3.5

National Estimate of the Annual Amount of Undercharging* in millions of Dollars by Retailers in 1991:
Estimates Subgrouped by Type of Coupon, Number of Registers, Vendor Monthly Redemption Total, and Metropolitan Location, with Standard Errors in Parentheses

Vendor Subgroup	Unweighted Number of Vendors Who Undercharged**	Estimated Annual Amount of Vendor Undercharging Millions of Dollars		
		Women and Children Food Instruments	Infant Food Instruments	TOTAL
Number of Registers				
1-5	174 [862]	$ 4.4 (11.3)	$ 1.7 (6.7)	$ 6.1 (1.6)
6 or more	44 [307]	$ 4.2 (1.6)	$ 1.6 (1.2)	$ 5.8 (1.9)
1991 Monthly WIC Redemption Amount				
Under $600	44 [307]	$ 0.1 (0.1)	$ 0.1 (0.1)	$ 0.2 (0.1)
$600-$1,999	69 [324]	$ 0.7 (0.1)	$ 0.3 (0.1)	$ 1.0 (0.2)
$2,000-$4,499	49 [259]	$ 1.8 (3.4)	$ 1.2 (0.7)	$ 3.0 (1.2)
$4,500 or more	56 [315]	$ 6.0 (1.8)	$ 1.7 (1.3)	$ 7.7 (1.9)
Metropolitan Location				
Metropolitan	139 [698]	$ 5.0 (1.3)	$ 2.5 (1.4)	$ 7.5 (2.0)
Non-Metropolitan	79 [507]	$ 3.6 (1.6)	$ 0.8 (0.4)	$ 4.4 (1.4)
TOTAL	218 [1,205]	$ 8.6 (2.1)	$ 3.3 (1.2)	$11.9 (2.5)

*Based on compliance buys made during the summer of 1991.
**Each number in brackets in this column is the total (unweighted) number of sample vendors, whether or not they overcharged, that were in the designated category.

Table 3.6

National Estimate of the Annual Dollar Amount* of Undercharging as a Percent of Total Redemption in 1991:
Estimates Subgrouped by Type of Coupon, Number of Registers, Vendor Monthly Redemption Total, and Metropolitan Location, with Standard Errors in Parentheses

Vendor Subgroup	Unweighted Number of Vendors Who Undercharged**	Estimated Annual Amount of Vendor Undercharging As a Percent of Total Redemptions		
		Women and Children Food Instruments	Infant Food Instruments	TOTAL
Number of Registers				
1-5	174 [862]	0.8% (0.21)	0.6% (0.23)	0.7% (0.18)
6 or more	44 [307]	0.5% (0.19)	0.3% (0.24)	0.5% (0.15)
1991 Monthly WIC Redemption Amount				
Under $600	44 [307]	0.4% (0.12)	0.9% (0.51)	0.5% (0.18)
$600-$1,999	69 [324]	0.7% (0.14)	0.5% (0.15)	0.6% (0.10)
$2,000-$4,499	49 [259]	0.8% (0.41)	0.8% (0.47)	0.8% (0.33)
$4,500 or more	56 [315]	0.6% (0.19)	0.3% (0.21)	0.5% (0.14)
Metropolitan Location				
Metropolitan	139 [698]	0.6% (0.14)	0.4% (0.22)	0.5% (0.13)
Non-Metropolitan	79 [507]	0.9% (0.37)	0.8% (0.17)	0.7% (0.22)
TOTAL	218 [1,205]	0.7% (0.15)	0.4% (0.18)	0.6% (0.12)

*Based on compliance buys made during the summer of 1991.
**Each number in brackets in this column is the total (unweighted) number of sample vendors, whether or not they overcharged, that were in the designated category.

Table 3.7

National Estimate of the Incidence* of Undercharging by Retail Vendors in 1991:
Estimates Subgrouped by Type of Coupon, Number of Registers, Vendor Monthly Redemption Total, Metropolitan Location, and Method of FI Processing, with Standard Errors in Parentheses

Vendor Subgroup	Unweighted Number of Vendors Who Undercharged**	Estimated Number of Vendors Who Would Undercharge on at Least One of the three Buys		
		Women and Children Food Instruments	Infant Food Instruments	TOTAL
Number of Registers				
1-5	174 [862]	2831	1219	4050
		(334)	(185)	(466)
6 or more	44 [307]	1434	188	1632
		(291)	(73)	(291)
1991 Monthly WIC Redemption amount				
Under $600	44 [307]	784	339	1123
		(207)	(132)	(388)
$600-$1,999	69 [324]	1353	392	1745
		(181)	(95)	(204)
$2,000-$44,499	49 [259]	920	411	1331
		(184)	(110)	(218)
$4,500 or more	56 [315]	1208	265	1474
		(308)	(87)	(300)
Metropolitan Location				
Metropolitan	139 [698]	2625	827	3453
		(392)	(177)	(519)
Non-Metropolitan	79 [507]	1640	580	2220
		(307)	(118)	(366)
Method of Food Instrument Processing				
Check	130 [779]	2200	853	3054
		(372)	(156)	(473)
Draft	27 [135]	570	200	770
		(257)	(123)	(373)
Voucher	61 [291]	1495	354	1849
		(270)	(68)	(288)
TOTAL	218 [1,205]	4265	1407	5673
		(457)	(207)	(578)

*Based on compliance buys made during the summer of 1991.

**Each number in brackets in this column is the total (unweighted) number of sample vendors, whether or not they undercharged, that were in the designated category.

Table 3.8

National Estimate of the Percent* of Retail Vendors Undercharging in 1991:
Estimates Subgrouped by Type of Coupon, Number of Registers, Vendor Monthly Redemption Total, Metropolitan Location, and Method of FI Processing, with Standard Errors in Parentheses

Vendor Subgroup	Unweighted Number of Vendors Who Undercharged**	Estimated Percent of Vendors Who Would Undercharge on at Least One of the three Buys		
		Women and Children Food Instruments	Infant Food Instruments	TOTAL
Number of Registers				
1-5	174 [862]	20.3% (1.86)	17.6% (2.49)	19.4% (1.73)
6 or more	44 [307]	16.4% (3.00)	4.3% (1.64)	12.3% (2.16)
1991 Monthly WIC Redemption amount				
Under $600	44 [307]	15.4% (3.32)	17.1% (5.67)	15.9% (3.46)
$600-$1,999	69 [324]	22.3% (2.59)	14.8% (3.68)	20.1% (2.19)
$2,000-$44,499	49 [259]	19.1% (3.23)	13.3% (3.68)	16.9% (2.79)
$4,500 or more	56 [315]	17.8% (3.59)	7.4% (2.26)	14.2% (2.47)
Metropolitan Location				
Metropolitan	139 [698]	19.8% (1.90)	12.0% (2.31)	17.1% (1.79)
Non-Metropolitan	79 [507]	17.3% (3.26)	13.2% (3.05)	16.0% (2.87)
Method of Food Instrument Processing				
Check	130 [779]	15.7% (2.08)	12.6% (1.79)	14.7% (1.66)
Draft	27 [135]	18.7% (6.99)	12.1% (7.59)	16.4% (6.69)
Voucher	61 [291]	26.5% (2.83)	12.4% (4.58)	21.7% (3.36)
TOTAL	218 [1,205]	18.8% (1.69)	12.4% (1.82)	16.7% (1.54)

*Based on compliance buys made during the summer of 1991.

**Each number in brackets in this column is the total (unweighted) number of sample vendors, whether or not they undercharged, that were in the designated category.

Based on the amount of undercharges in the sample, the estimated total annual undercharge for safe buys for 1991 from Table 3.5 is $11.9 million -- about 30% of the estimated annual overcharges for safe buys. The net overcharge estimate for safe buys for 1991 among vendors participating for at least 12 months is therefore $27.5 million (i.e., $39.5 million minus $11.9 million).

Table 3.6 shows that the percent of dollars affected by undercharging on safe buys averages 0.6 percent, varying from 0.3 to 0.9 percent depending upon the subgroup considered. However, as shown in Tables 3.7 and 3.8, undercharging is a widespread phenomenon, occurring on at least one of three safe buys in an estimated 16.7 percent (i.e., 5,673) of WIC vendors and ranging from 4.3 to 26.5 percent of vendors depending upon the subgroup considered.

Table 3.8 shows that vendors with 1-5 registers are more likely than those with 6 or more registers to undercharge on infant food instruments (17.6% versus 4.3%). However, this difference is not statistically significant when comparing dollar amounts of undercharging as a percent of redemptions (Table 3.6). Also Table 3.8 shows that vendors operating under a voucher system are more likely than those operating under a check system to undercharge on women and children's food instruments.

It is difficult to explain why vendor undercharging appeared in the survey at such high levels, especially since there is no clear financial incentive for the vendors to undercharge. Some of it is undoubtedly random error, but the levels appear to be too high for this to be the only source. Although some hypotheses about the reasons for undercharging have been conjectured, this study found no evidence to support any of these hypotheses.

For example, one such hypothesis was that vendors sometimes undercharge a participant to allow a WIC purchase to be made when the actual cash price would exceed the limiting value of the FI (i.e., the "not to exceed" (NTE) amount). This hypothesis was investigated by comparing the overcharge rates and undercharge rates between vendors in States that have NTE amounts on their FIs and vendors that do not have NTE amounts on their FIs (Appendix VIII). However, this comparison, which is illustrated in Tables VIII.2 and VIII.3 does not support the hypothesis of a higher undercharge rate or amount in States that have NTE amounts on their FIs.

The estimates of the dollar annual amounts and vendor incidence of undercharging given in Tables 3.5 - 3.8 are also illustrated in Exhibits 3.5 - 3.8. These exhibits show the subgroup comparisons of absolute amounts of undercharges together with the corresponding comparisons of relative amounts (percents).

Estimates of mischarging by vendor characteristics

Tables 3.9 and 3.10 examine the undercharge and overcharge phenomena further by providing national estimates, by number of cash registers, of the number of WIC vendors (and associated dollar amounts) who (1) would overcharge only on at least one of the three safe buys (pure overcharge), (2) would undercharge only on at least one of the three safe buys (pure undercharge), and (3) would both overcharge on at least one of the three safe buys and undercharge on at least one of the three buys (overlap). The latter, which represents a net overcharge, is not meant as a correction for random-error but rather as another way to interpret the data.

Exhibit 3.5

National Estimate of the Annual Dollar Amount of Undercharging by Retail Vendors in 1991:
Women and Children Food Instruments Sample

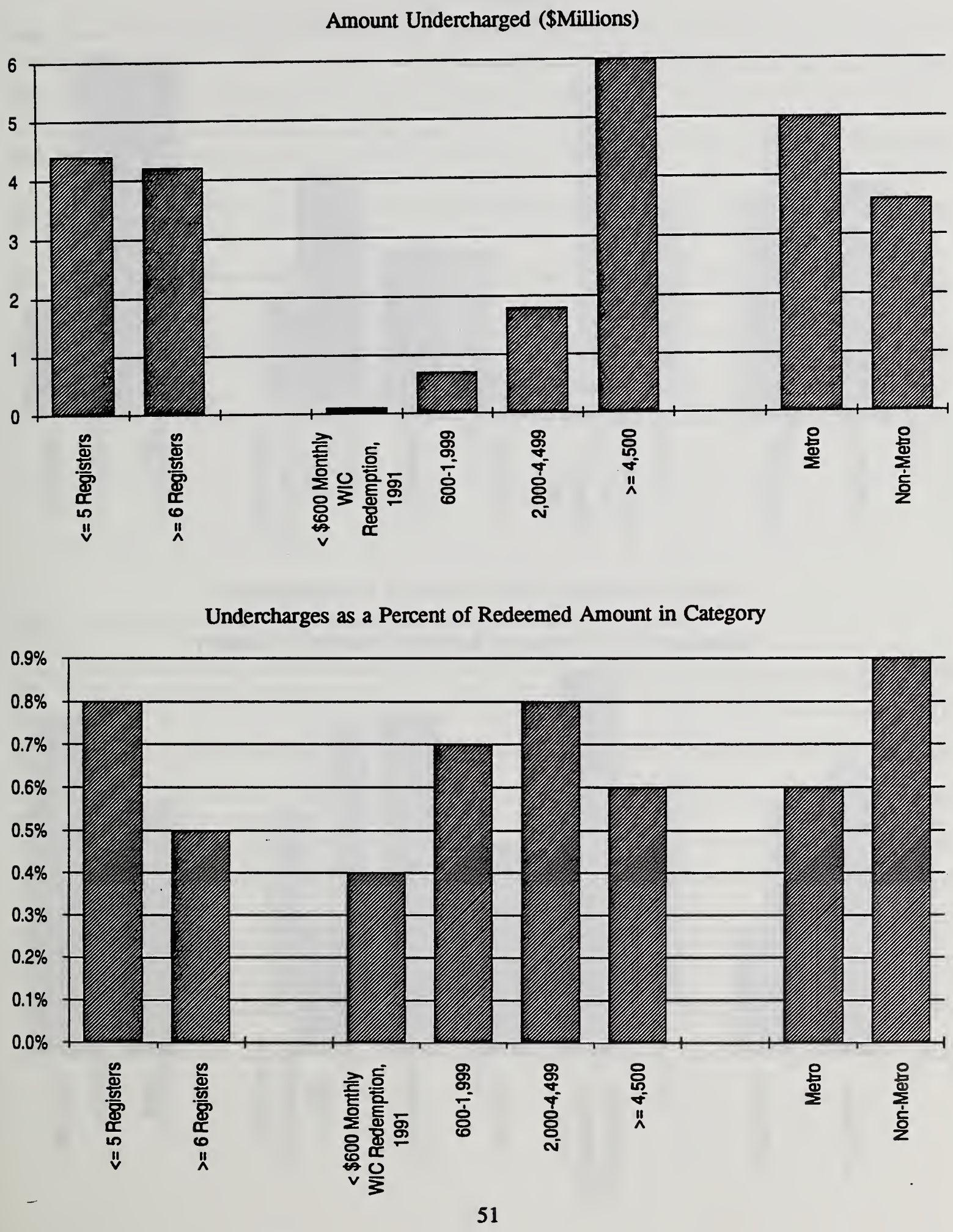
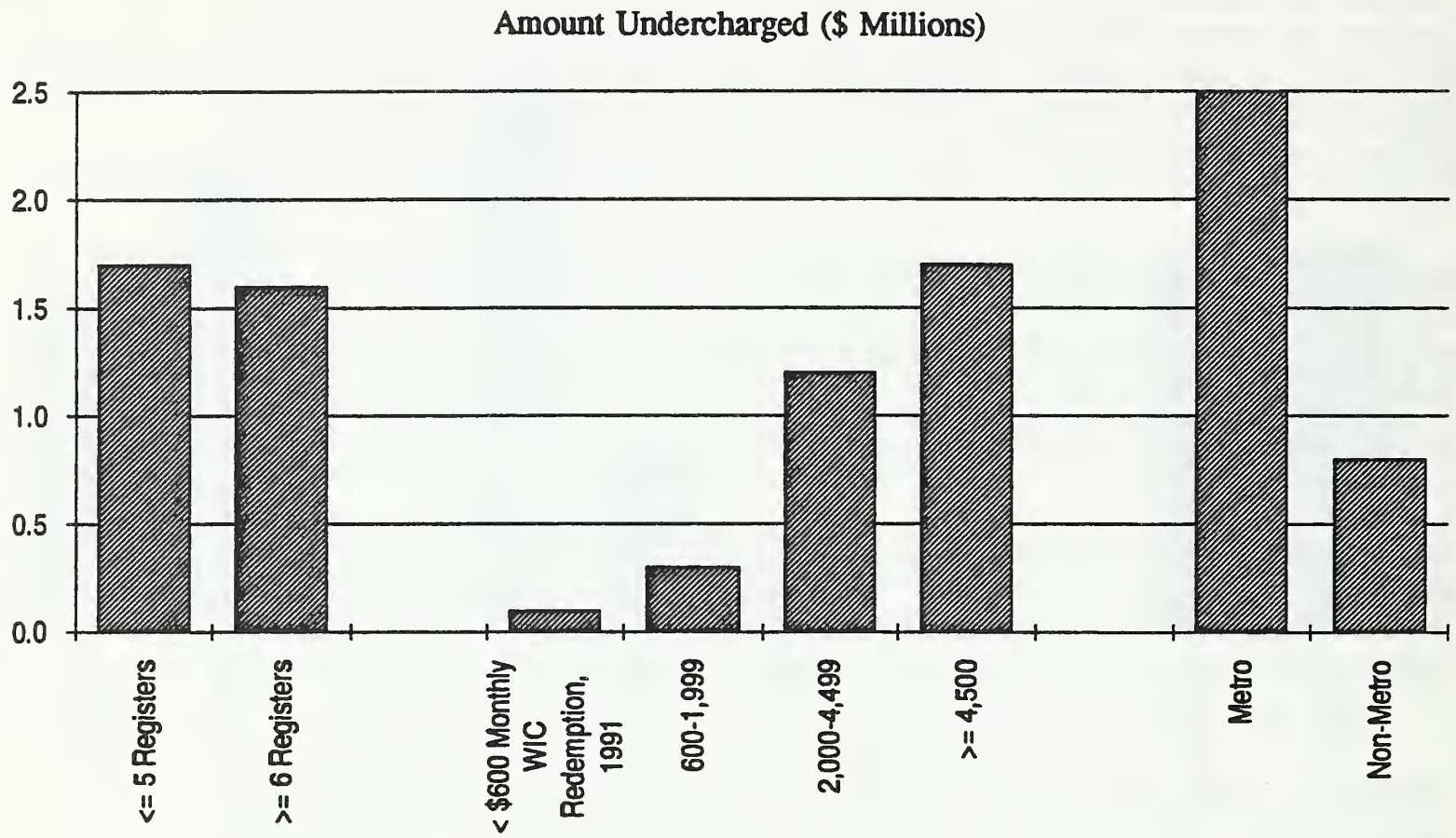


Exhibit 3.6

National Estimate of the Annual Dollar Amount of Undercharging by Retail Vendors in 1991:
Infant Food Instruments Sample



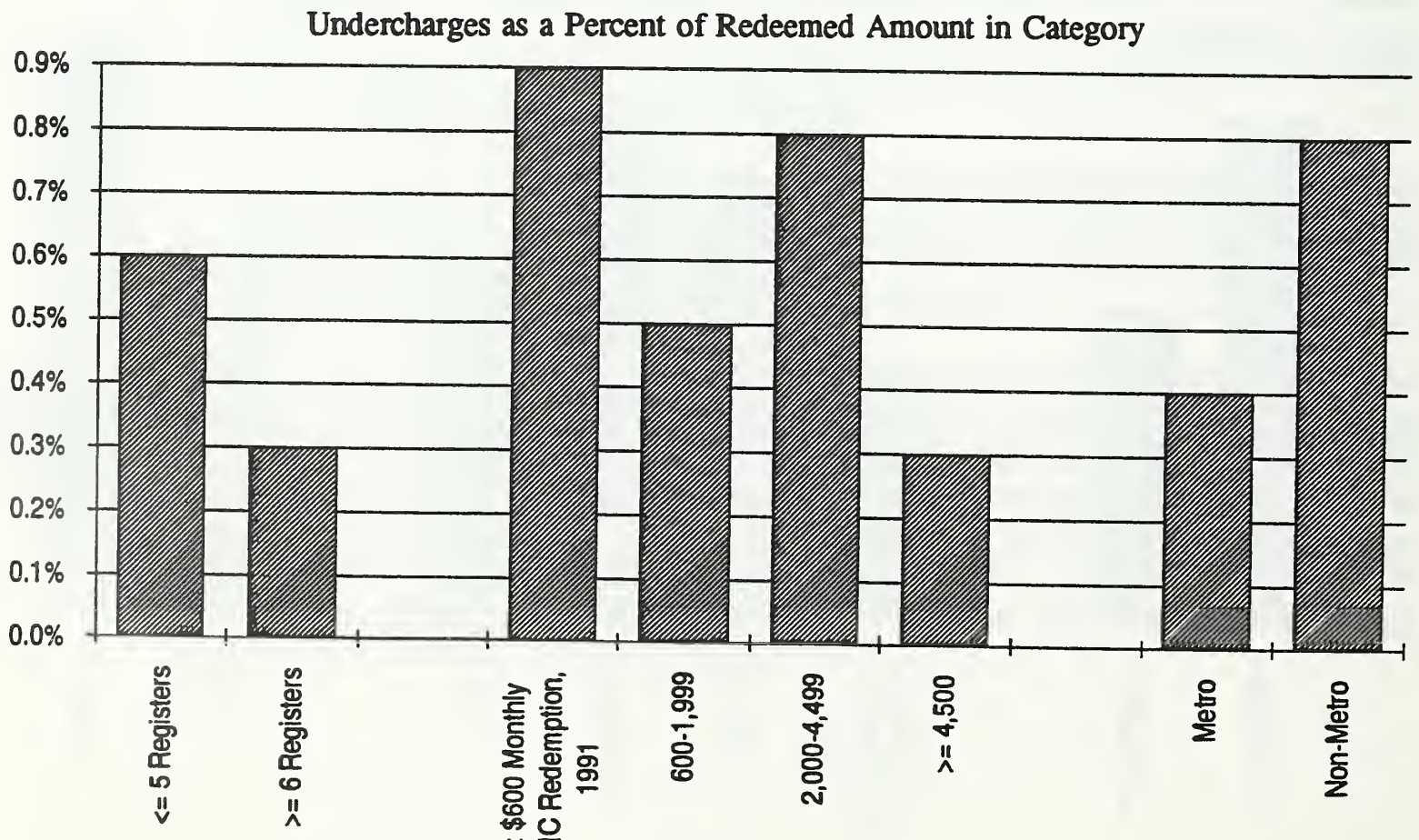


Exhibit 3.7

National Estimate of Incidence and Percent of Undercharging by Retail Vendors in 1991: Women and Children Food Instruments Sample

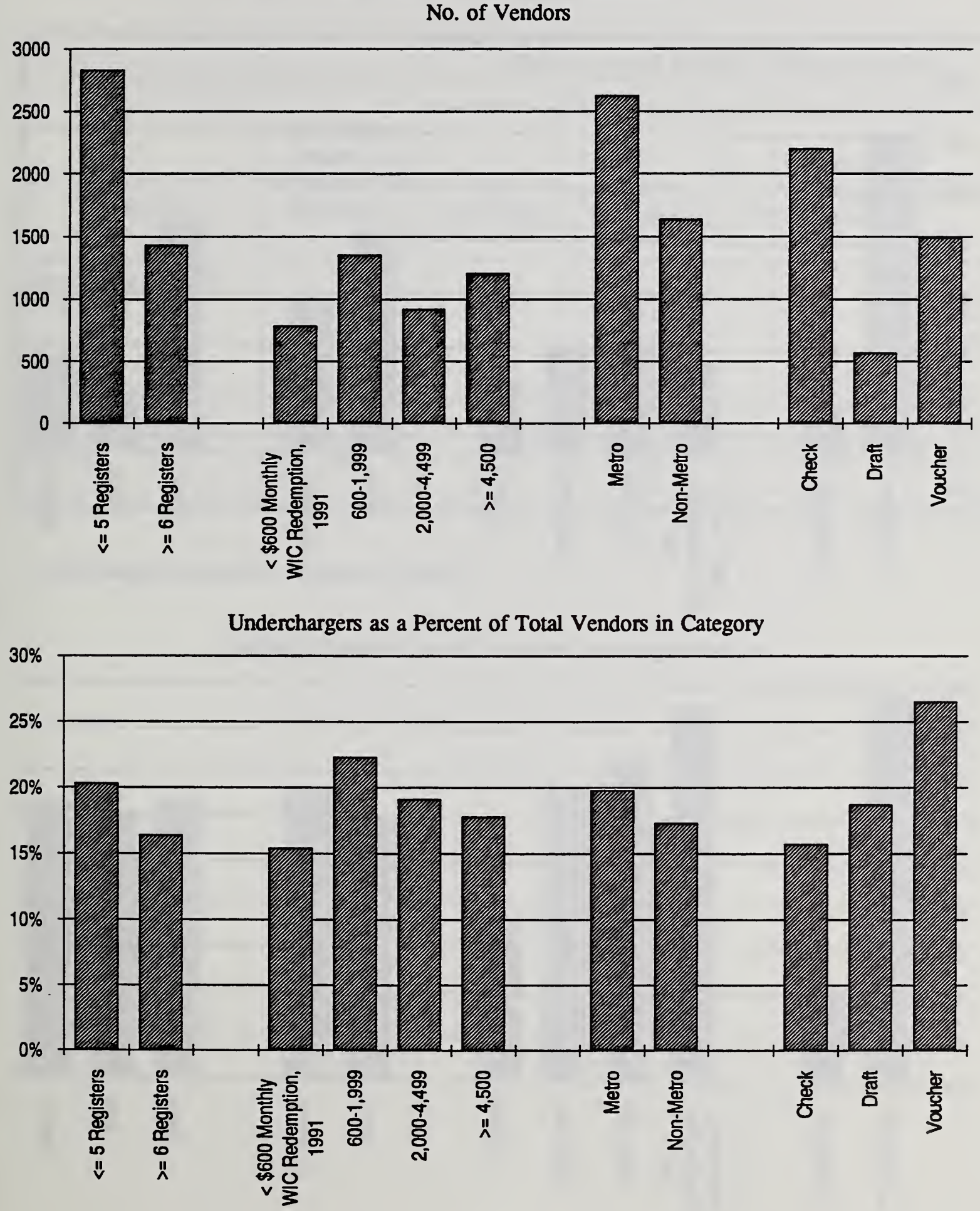


Exhibit 3.8

National Estimate of Incidence and Percent of Undercharging by Retail Vendors in 1991:
Infant Food Instruments Sample

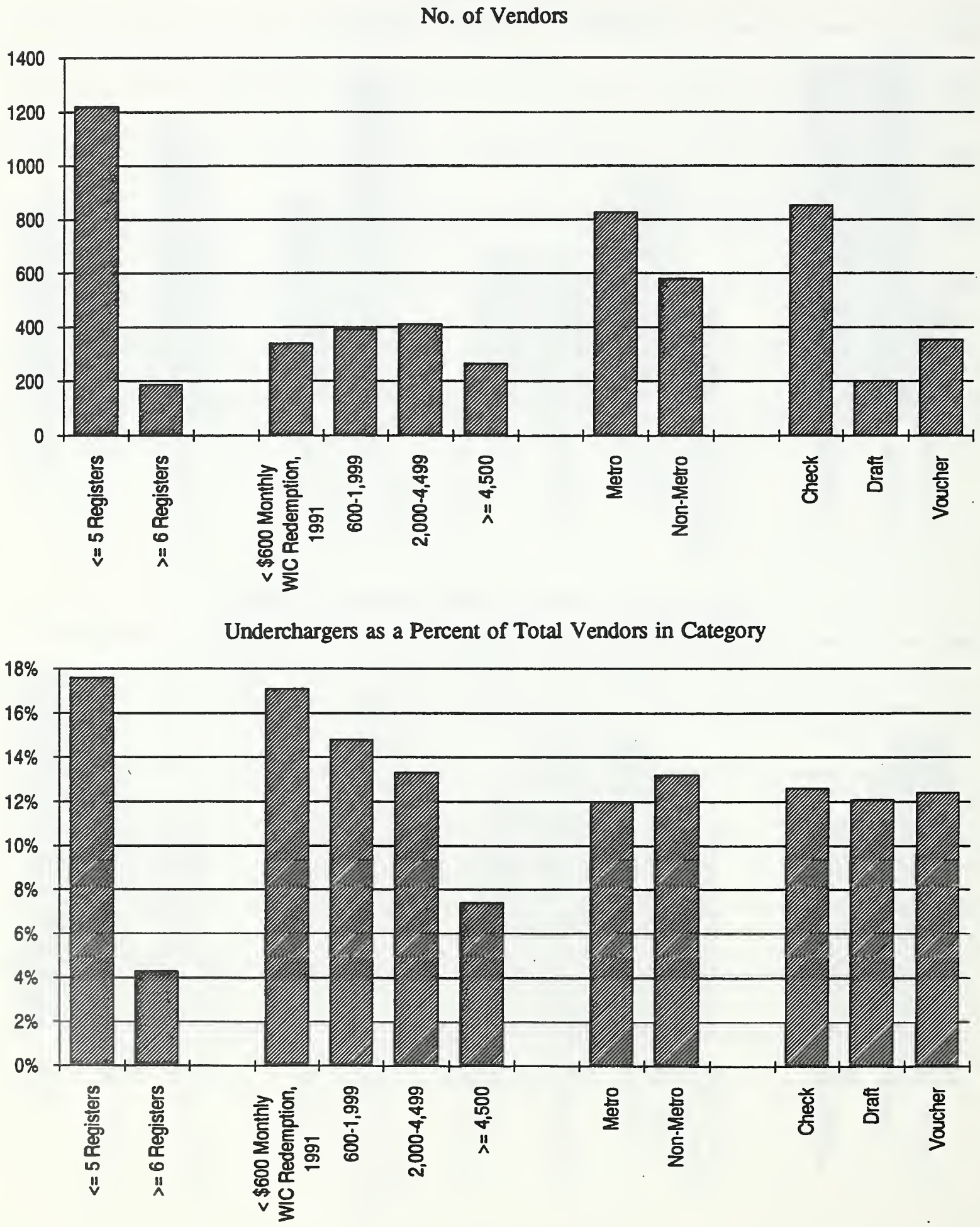


Table 3.9

Estimated Dollar Impact (in millions) of Mischarging During 1991:
Estimates Subgrouped by Number of Registers and Whether Vendors
Only Overcharged, Only Undercharged, or Did Both,
with Standard Errors in Parentheses

Vendor Size	Unweighted Number of Vendors Who Mischarged	Estimated Annual Amount (Millions of Dollars)			
		Pure Overcharge	Pure[1] Undercharge	Under and Overcharge (Net Overcharge)	TOTAL
Number of Registers					
1-5	383	26.0 (7.8)	-3.3 (1.0)	3.8 (2.5)	26.5 (8.5)
6 or more	75	4.3 (1.6)	-4.1 (1.7)	0.9 (0.8)	1.1 (2.3)
TOTAL	458	30.3 (7.9)	-7.4 (1.9)	4.7 (2.6)	27.6 (9.2)

[1] Undercharges are shown as negative numbers

Table 3.10

National Estimate of the Incidence* of Mischarging on Three Compliance Buys:
Estimates Subgrouped by Number of Registers, and Whether Vendor Only Overcharged, Only Undercharged, Did Neither, or Did Both, with Standard Errors in Parentheses

Vendor Size	Total Unweighted Number of Vendors	Estimated Number of Vendors				
		No Mis-charges	Pure Over-charge	Pure Under-charge	Under and Overcharge	TOTAL
Number of Registers						
1-5	862	12,209 (1,344)	4,636 (344)	2,634 (387)	1,416 (259)	20,895 (1,808)
6 or more	307	10,358 (818)	1,158 (263)	1,268 (282)	354 (104)	13,138 (872)
TOTAL	1,169	22,567 (1,621)	5,794 (418)	3,902 (525)	1,770 (272)	34,033 (1,940)

*Based on compliance buys made during the summer of 1991.

An interesting result from Table 3.9 is that the estimated "pure" overcharge amount for stores with six or more registers ($4.3 million) is roughly equal to the "pure" undercharge amount for this same group of stores (-$4.1 million). This suggests, though it certainly does not prove, that for these larger stores the tendency is for overcharges and undercharges to be roughly equal and to be mostly random errors. However, if that were true, the "overlap" vendors should generate a net overcharge estimate of roughly zero. In this case, the estimate is $900,000, though the estimated standard error is almost as large as the estimate. Consequently, the 95% confidence interval for the population net overcharge amount for the "overlap" vendors with six or more registers includes zero. This allows the possibility that the net overcharge is near zero for all "overlap" vendors with six or more registers.

For the stores with 1-5 registers, the estimated amount of overcharges is much larger than the undercharge estimates. This suggests that overcharging is more of a problem with smaller stores than with larger stores, a result that is consistent with data provided in Tables 3.1 through 3.4.

3.3 ESTIMATES OF THE RATE OF VARIOUS TYPES OF VIOLATIONS

In addition to overcharging, there were a number of WIC Program violations that were investigated in this study. They consisted primarily of specific procedures that WIC authorized vendors are suppose to follow and which can be observed during a buy. The procedures were part of a checklist that was to be completed by the investigator at the time of each compliance buy. (An exception is altering the price recorded on the FI, which could only be checked after the vendor redeemed the FI.)

Following is the list of specific WIC vendor violations that were noted by the investigators when they occurred on a compliance buy:

1) One or more WIC foods listed on the FI were not available.

2) The vendor asked the investigator to buy another item in substitution for a WIC food that the investigator intended to buy.

3) The cashier did not verify the WIC ID card (This is not a universal program violation as some states do not issue or require an ID card).

4) The cash register receipt was not provided (This is technically not a Program violation, but it was included on the checklist to see if it is related to Program offenses, such as overcharging.)

5) The cashier did not enter the purchase price on the FI at the time of purchase.

6) The investigator was not asked to sign the FI.

7) The investigator was asked to pay cash for WIC foods in addition to the FI.

8) The investigator was asked to accept cash or credit for an FI.

9) The investigator was asked to use a special cash register.

10) The investigator was advised to purchase only certain brands of foods (Brand limitation may be standard WIC procedure in some states).

In addition, the following violations were identified by the study after the FIs were redeemed.

11) The vendor altered the amount originally entered by the cashier on the FI.

12) Overcharging: the investigator was charged more than the shelf price for the WIC food package or the investigator was charged for foods not received at the time of the buy.

National estimates of program violations

Table 3.11 presents national estimates of the number of WIC vendors who would commit one, multiple, or no violations on each of the three compliance buys. These estimates are given separately for small vendors (1-5 registers) and large vendors (6 or more registers). An interesting result from this table is that the number of violations committed does not increase for the second and third compliance buys. This is consistent with the earlier conclusion that the rate of overcharging does not increase for later compliance buys.

Another interesting result from Table 3.11 is the larger estimated proportion of vendors who would commit multiple offenses for the smaller stores as compared to larger stores. This tendency is present for all three compliance buys. For the first compliance buy, 18.5% of the smaller vendors (1-5 registers) committed multiple offenses compared to only 6.8% of the larger vendors (6 or more registers). The corresponding comparisons for the second and third buys are 16.4% versus 9.8 % and 15.3% versus 5.4%. All three of these differences are significant at the 5% level.14/ This is consistent with earlier findings that suggest that smaller stores are more likely to commit Program violations.

Tables 3.12 and 3.13 focus on specific types of violations. Table 3.12 provides national incidence estimates of a serious abuse: vendor-initiated substitution. The estimated occurrence of vendor-initiated substitution is lower by far than that of overcharging or undercharging. Recall that this estimate is based only on the first three safe buys. An estimated 5.5 percent of vendors (1,860/34,033) would initiate a substitution on at least one of the safe buys. The incidence of such violations is significantly higher for vendors with 1-5 registers compared to vendors with 6 or more registers (7.3% vs. 2.5%).

14/ For the first comparison, the estimated standard error of the difference was calculated as the square root of the sums of squares of 2.2 and 2.3, which equals 3.2. The corresponding test statistic (z-score) is 18.5 minus 6.8, divided by 3.2, which equals 3.7. Since this ratio exceeds 1.96, it is significant at the 5 percent level. Using the same procedure, the test statistic for the second difference is 2.1 (i.e., 16.4 minus 7.8, divided by 3.1). Also, the test statistics for the third difference is 4.5 (i.e., 15.3 minus 5.4, divided by 2.2).

Table 3.11

National Estimate* of Vendors Who Would Commit Single or Multiple Violations:
Estimates Subgrouped by Compliance Buy and Number of Cash Registers, with Standard Errors in Parentheses

		Estimated Number of Vendors							
		Vendors with 1-5 Registers				Vendors with 6 or more Registers			
		No. of Vendor Violations**				No. of Vendor Violations**			
Compliance Buy	Total Unweighted No. of Vendors	Single Offense	Multiple Offenses	No Offenses	Total Vendors***	Single Offense	Multiple Offenses	No Offenses	Total Vendors***
First Buy									
Number	1,169	5,654 (627)	3,835 (448)	11,295 (1320)	20,784 (1,808)	5,100 (699)	884 (301)	7,017 (561)	13,001 (856)
Percent		29.2% (3.0)	18.5% (2.2)	54.3% (6.4)	100%	39.2% (5.4)	6.8% (2.3)	54.0% (4.3)	100%
Second Buy									
Number	1,169	4,733 (686)	3,401 (431)	12,642 (13.13)	20,776 (1,808)	4,497 (593)	1,289 (296)	7,352 (693)	13,138 (857)
Percent		22.8% (3.3)	16.4% (2.1)	60.8% (6.3)	100%	34.2% (4.5)	9.8% (2.3)	56.0% (5.3)	100%
Third Buy									
Number	1,163	4,399 (448)	3,143 (339)	13,028 (1,439)	20,570 (1,804)	4,047 (407)	706 (197)	8,385 (725)	13,138 (857)
Percent		21.4% (2.2)	15.3% (1.6)	63.3% (7.0)	100%	30.8% (3.1)	5.4% (1.5)	63.8% (5.5)	100%

*Based on compliance buys made during the summer of 1991.

**The vendor violations included in this table are given in Section 3.3, except that verification of the WIC ID card was excluded.

***The sums of the sample vendor weights (estimated total number of vendors) for the three buys differ slightly because (1) there was some missing offense data from the CBOR for a few sample vendors and (2) the third buy was not carried out for a small number of vendors.

Table 3.12

National Estimate of the Incidence* of Vendor-Initiated Substitution:
Estimates Subgrouped by Number of Cash Registers
with Standard Errors in Parentheses

Vendor Size	Unweighted No. of Vendors Who Initiate a Substitution Violation**	Estimated Number and Percent of Vendors Who Would Initiate a Substitution Violation, with Standard Errors in Parentheses	
		Number	Percent
Number of Registers			
1-5	61 [862]	1,532 (270)	7.3% (1.3)
6 or more	11 [307]	328 (101)	2.5% (0.8)
ALL VENDORS	72 [1,169]	1,860 (280)	5.5% (0.8)

*Based on compliance buys made during the summer of 1991.

**Each number in brackets in this column is the total (unweighted) number of sample vendors, whether or not they committed a substitution violation, that were in the designated category.

Table 3.13

National Estimate of the Incidence* of Vendors Failing to Maintain an Adequate Stock, Discriminating Against WIC Participants, or Failing to Record the Purchase Price at the Time of Sale:
Estimates Subgrouped by Type of Coupon and Number of Registers, with Standard Errors in Parentheses

Vendor Subgroup	Unweighted Number of Vendors Who Committed At least One of the Three Violations***	Estimated Number and Percent** of WIC Vendors Who Would Commit the Specified Violation on at Least One of the Three Buys					
		Failing to Maintain An Adequate Stock		Discriminating Against WIC Participants		Not Recording Purchase Price at the Time of Sale	
		Number	Percent	Number	Percent	Number	Percent
FI Type							
Women	93 [273]	1,350 (244)	18.2% (3.3)	59 (59)	0.8% (0.8)	1,425 (217)	19.2% (2.9)
Infants	133 [398]	1,806 (429)	16.0% (3.8)	156 (94)	1.4% (0.8)	1,583 (270)	14.0% (2.4)
Children	187 [534]	2,583 (562)	16.9% (3.7)	254 (109)	1.7% (0.7)	2,725 (277)	17.8% (1.8)
Number of Registers							
1 - 5	356 [862]	4,706 (968)	22.5% (4.6)	410 (143)	2.0% (0.7)	4,392 (444)	21.0% (2.1)
6 or more	57 [307]	1,033 (214)	7.9% (1.6)	59 (59)	0.5% (0.5)	1,341 (320)	10.2% (2.4)
TOTAL	413 [1,205]	5,739 (1,049)	16.9% (3.1)	469 (486)	1.4% (1.4)	5,733 (575)	16.9% (1.7)

*Based on compliance buys made during the summer of 1991.

**The weighted vendor totals for women's, infant's, and children's coupons are 7411, 11304, and 15318. These totals serve as the denominators for the percents that appear in the top half of this table.

***Each number in brackets in this column is the total (unweighted) number of sample vendors, whether or not they committed any violations, that were in the designated category.

Table 3.13 provides national estimates of the incidence of three specific violations: failing to maintain adequate stock, discriminating against WIC customers (i.e., sending them to a specific cash register), and failing to record the purchase price at the time of sale. The estimates of the incidence of WIC customer discrimination indicates that this occurs infrequently (i.e., an estimated 1.4% of the vendors). In terms of subgroup comparisons, the incidence rate estimates for these violations are again significantly higher for smaller stores than for larger stores. Failing to maintain adequate stock would occur for an estimated 22.5% of the smaller as compared to only 7.9% of the larger vendors. Also, failing to record the purchase price at the time of sale would occur for an estimated 21% of smaller vendors as compared to 10.2% of the larger vendors. Both of these differences are significant at the 5% level. Finally, though the difference is relatively small between smaller and larger stores in terms of the estimated percent that would discriminate against WIC customers (2% vs. 0.5%), it is significant at the 10% level.

3.4 THE RELATIONSHIP OF MISCHARGING AND OTHER PROGRAM OFFENSES

Even though it is unweighted,15/ Table 3.14 provides useful information regarding the relationship between overcharging and other Program offenses. Across all 3,543 basic buys (except for a few that had missing CBOR information), this table gives the simple percent of responses for each of the first ten compliance questions on the CBOR. Then, for the buys that fall in each response to a question, it gives the simple percent of these buys that were overcharges, undercharges, and correct charges. For example, for Question 5, it indicates that for 87 percent of the buys, the cashier entered the price on the FI at the time of sale. Of these 87 percent, there were overcharges on only 10 percent. However, for the 13 percent of the buys in which the cashier did not enter the price on the FI at the time of sale, 40 percent turned out to be overcharges -- four times the rate as for the other buys (i.e., relative risk = 4.0). In contrast, whether or not the investigator was asked to show his/her ID was unrelated to whether or not the buy was an overcharge or an undercharge.

Relationship between overcharging and other violations

From this table several violations can be identified that seem to be related to the presence of an overcharge. In addition to the violation noted above, the violations which appear to be most related to overcharging are (1) failing to keep adequate stock of WIC foods (relative risk = 2.2), (2) a vendor-initiated substitution (relative risk = 1.8), (3) countersigning violations (relative risk = 3.4) and (4) failing to provide a cash register receipt (relative risk = 6.0), though technically not a Program violation (also see Appendix X for information on rainchecks). In this study, 51 percent of the buys were accompanied by register receipts and 49 percent were not. The relationship between failure to provide a cash register

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15/ Because there really is no selection probability that applies to buys, as there is for vendors, buys cannot legitimately be assigned weights.

Table 3.14

Unweighted Percent of Overcharge and Undercharge Compliance Buys:
Estimates Subgrouped by the Presence or Absence of Various Types of Violations (Total Buys = 3,543)

CBOR Question		Question Response*	Percent of Buys	Row Percent of Buys		
				Over-charge	Under-charge	Correct Charge
Q.1	All WIC Foods in Stock	Yes	92	10	8	80
		No	8	24	8	66
Q.2	Vendor Initiated Substitution	No	98	13	8	79
		Yes	1	24	14	66
Q.3	WIC ID Requested	Yes	38	14	9	76
		No	62	13	8	79
Q.4	Received Register Receipt	Yes	51	0	3	93
		No	49	24	14	67
Q.5	Cashier Entered Price on Food Instrument	Yes	87	10	7	93
		No	13	10	17	93
Q.6	Timing of Investigator Counter-signature	After price entered on FI	63	7	7	86
		Before price entered on FI, after sale	15	21	9	70
		Before sale	20	27	13	60
		Not asked to sign	2	13	10	67
Q.7	Additional cash payment required by vendor	No	99	14	8	78
		Yes	1	14	17	79
Q.8	Offered credit or cash for other Food Instruments	No	99.9**	14	7	77
		Yes	0.1**	0	0	100
Q.9	Special WIC Register	No	99	14	9	77
		Yes	1	12	9	88
Q.10	Brand Restriction	No	98	14	8	79
		Yes	2	12	20	68

*The question responses (yes/no) are listed in the order of the non-abusive or standard procedure first and the abuse or non-standard procedure second. Therefore, the "yes" response is not always the first one listed.

**An extra decimal place is given for these percents because the percent for the "Yes" response otherwise would round to zero.

receipt and overcharging was not investigated further because insufficient information was collected from the states concerning their particular policies on register receipts.

Table 3.15 is very similar to Table 3.14, except that it applies to estimates of the percent of vendors with various characteristics, rather than the percent of buys. Because it is vendor-based, it is a weighted table. For Table 3.15, the percent of vendors who "fail" a check item (question) is the estimated percent of all WIC vendors who would fail the check item on at least one of three safe buys. For example, for the first question about WIC foods being in stock, an estimated 83 percent of the vendors would have the WIC foods in stock **on all three buys**. Of these, an estimated 15 percent would overcharge only on at least one buy, 12 percent would undercharge only on at least one buy, and an estimated 5 percent would commit both an undercharge and overcharge error among the three buys.

It is interesting to note that the violations that are related to overcharging in Table 3.14 also are related to overcharging in Table 3.15. In this case, the weighted and unweighted results are similar.

Relationship between number of items purchased and over-charging

Table 3.16 examines whether there was a relationship between the number of items purchased in a compliance buy and the frequency of mischarging.16/ The data suggest that there was an increase in both overcharging and under-charging as the number of items purchased increased. For example, while charging 10.5 percent of all compliance buys involving one or two items resulted in overcharging, the frequency increased to 16.8 percent when three or four items were purchased, and 16.4 percent when five or more items were purchased. Similarly, increases in undercharging also increased as the number of items purchased increased, with a frequency range of 7.1 percent for one to two items purchased to 12.3 percent when five or more items were purchased.

Additional information on mischarging frequency and amounts is given in Appendices IX and X. In Appendix IX, distributions of mischarge amounts by buys, and by vendors, are given. Also, distributions of mischarge amounts are given for vendors who are repeat offenders, (i.e., who overcharged or undercharged the investigator on at least two buys). In Appendix X, Table X.2 looks at some specific properties of overcharging vendors. For these vendors, the table provides estimated numbers who entered the purchase price at the time of sale and who altered the purchase price on the FI after the sale. An interesting result from this table is that the proportion of overcharging vendors who altered the purchase price on the FI was about 10 percent. Also, the estimated percent of overcharging vendors who entered the price on the FI at the time of purchase was rather high (i.e., 100% for vendors with no additional violations and 58% for vendors with at least one violation in addition to overcharging). This suggests that for many overcharges, the incorrect (inflated) price was entered on the FI in the presence of the participant.

16/ As used here, an item refers to a category of WIC foods. For example, two dozen eggs were counted as one item, and 31 cans of infant formula were counted as one item. The maximum number of items specified on an FI was 9.

Table 3.15
Weighted Percent of Vendors that Overcharged, Undercharged or Both:
Estimates Subgrouped by the Presence or Absence of Various
Violations Across All Three Buys (Total Weighted Number of Vendors = 34,033)

	CBOR Question	Question Response*	Percent of Vendors**	Row Percent of Vendors			
				Pure Over-charge	Pure Under-charge	Over & Under-charge	No Mischarge
Q.1	All WIC Foods in Stock	Yes	83	15	12	5	68
		No	17	27	11	7	55
Q.2	Vendor Initiated Substitution	No	96	17	11	5	67
		Yes	5	24	11	12	67
Q.3	WIC ID Requested	Yes	26	15	13	5	66
		No	74	17	11	5	66
Q.4	Received Register Receipt	Yes	48	7	0	0	87
		No	17	27	17	10	46
Q.5	Cashier Entered Price on Food Instruments	Yes	83	13	11	3	73
		No	17	15	17	14	57
Q.6	Timing of Investigator Counter-signature	After price entered on FI	80	14	11	4	71
		Before price entered on FI, after sale	32	23	13	6	58
		Before sale	31	25	11	8	55
		Not asked to sign	5	13	9	12	66
Q.7	Additional cash payment required by vendor	No	98	12	11	5	67
		Yes	2	12	23	8	68
Q.8	Offered credit or cash for other Food Instruments	No	99.5***	17	12	5	66
		Yes	0.5***	17	0	0	87
Q.9	Special WIC Register	No	99	17	12	5	66
		Yes	1	34	0	0	55
Q.10	Brand Restriction	No	96	17	11	5	67
		Yes	4	25	18	12	45

* The question responses (yes/no) are listed in the order of the non-abusive or standard procedure first and the abuse or non-standard procedure second. Therefore, the "yes" response is not always the first one listed.

** For the first response to each question, other than Q.6, this is the weighted percent of vendors who had that response on all three buys. For the second response to each question, and for all four possible responses to Q.6, this is the weighted percent of vendors who had that response on at least one of the three buys. The weighted percents for the Q.6 responses add to more than "100%" because the same vendor can be counted in more than one of the responses.

*** An extra decimal place is given for these percents because the percent for the "Yes" response otherwise would round to zero.

Table 3.16

Distribution of Type of Mischarging by Number of Items Purchased in the Compliance Buys (Unweighted)

Frequency Row Percentage	Type of Mischarging			TOTAL
Number of Items	None	Over	Under	
1-2	1,612 82.4%	205 10.5%	139 7.1%	1,956
3-4	779 74.8%	175 16.8%	88 8.4%	1,042
5 or more	376 71.1%	87 16.4%	66 12.5%	529
TOTAL	2,767 78.5%	467 13.2%	293 8.3%	3,527

3.5 RELATIONSHIP OF MISCHARGING AND LENGTH OF CASH REGISTER LINES

Tables 3.17 and 3.18 present unweighted counts of the number of buys with overcharging and undercharging by the number of customers in line at the time of the buy. The percents shown are of the total number of buys with the length of line associated with the cell. These total numbers (i.e., bases for the cell percents) are given in Table VI.1, Appendix VI along with other tables that examine the association between the various evaluations and length of cash register line.

Table 3.18 indicates that there is no apparent association between undercharging and length of line. Although the cell overcharge percents vary more (Table 3.17) than do the cell undercharge rates (Table 3.18), there does not appear to be an obvious pattern for either overcharges or undercharges. It might be expected the cells representing buys with no one in line behind the investigator would show a higher overcharge rate than would other cells, especially the "unwitnessed" buy of the 0-0 cell. However, this tendency is not apparent. In fact, the cells representing buys with three or more people in line behind the investigator have many of the higher overcharge rates.

3.6 INVESTIGATOR-INITIATED SUBSTITUTION

Investigators were instructed to try a major substitution from approximately one-third of the vendors. The substitution, a non-WIC food item, was to occur on the last of a four-buy sequence (see Exhibit 1.3, Buy Group C, buy 4). Vendors where this was to be attempted were selected at random. A major substitution was attempted at 231 of the vendors and 6 were successful (unweighted).

Table 3.19 presents the national estimates of investigator-initiated major substitution during the summer 1991. Overall, only 1.9 percent of the attempts were successful. Rates of major substitution were not significantly different among the various subgroups of vendors.

Based on these results, it appears that following three safe buys, only a small number of vendors allow unauthorized substitutions for WIC foods when simply presented a major substitution without verbal encouragement.

Table 3.17

The Number of Buys (Unweighted) with Overcharges, by the Length of Cash Register Line at the Points of Entry and Purchase, Including Percents of Cell Totals (Table VI.1, Appendix VI)

PERSONS BEHIND AT POINT OF PURCHASES	PERSONS IN FRONT AT POINT OF ENTRY				
	0	1	2	3 or more	TOTAL
0	178 18.0%	42 11.6%	10 10.8%	5 15.2%	235 15.9%
1	55 11.0%	48 9.9%	17 8.6%	8 12.7%	228 10.3%
2	15 10.2%	26 12.4%	9 8.8%	7 10.3%	57 10.8%
3 or more	15 25.0%	16 17.2%	9 14.8%	7 10.9%	47 16.9%
TOTAL	263 15.5%	132 11.5%	45 9.9%	27 11.8%	467 13.2%

Table 3.18

The Number of Buys (Unweighted) with Undercharges, by the Length of Cash Register Line at the Points of Entry and Purchase, Including Percents of Cell Totals (Table VI.1, Appendix VI)

PERSONS BEHIND AT POINT OF PURCHASE	PERSONS IN FRONT AT POINT OF ENTRY				
	0	1	2	3 or more	TOTAL
0	77 7.8%	34 9.4%	11 11.8%	3 9.1%	125 8.5%
1	34 6.8%	37 7.6%	16 8.1%	5 7.9%	92 7.4%
2	13 8.8%	21 10.0%	10 9.8%	7 10.3%	51 9.7%
3 or more	3 5.0%	8 8.6%	7 11.5%	6 9.4%	24 8.6%
TOTAL	127 7.5%	100 8.7%	44 9.7%	21 9.2	292 8.3%

Table 3.19

National Estimate of the Incidence Rate of Investigator-initiated Abuse* (Major Substitution) During Summer 1991: Estimates Subgrouped by Number of Registers, Vendor Monthly WIC Redemption Total, and Metropolitan Location with Standard Errors in Parentheses

Characteristics of Vendors	No. of Vendors Unweighted Counts*	Incidence Rate
Number of Registers		Percentage
1-5	5 [169]	1.8% (0.97)
6 or more	1 [62]	2.1% (2.22)
Monthly WIC Dollar Redemption Amount, 1991		
Under $600	1 [43]	1.1% (1.25)
$600 - $1,999	2 [69]	4.0% (3.52)
$2,000 - $4,499	2 [63]	1.1% (0.87)
$4,500 or more	1 [56]	1.0% (1.00)
Location of Vendor		
Metropolitan Location	2 [124]	1.8% (1.69)
Non-Metropolitan Location	4 [107]	2.0% (1.03)
TOTAL	6 [231]	1.9% (1.02)

*Each number in brackets in this column is the total (unweighted) number of sample vendors in the designated category.

CHAPTER 4:
MULTIVARIATE ANALYSES

4.0 MULTIVARIATE ANALYSES

As part of the investigation of the conditions associated with vendor overcharging and undercharging, logistic regressions and discriminant analyses were conducted. In both applications, a set of predictor (or explanatory) variables was used to predict which of two groups a vendor was likely to fall. A more technical discussion of these two methods is given in section XI.1 of Appendix XI.

Because of its major focus on group identification, the discriminant analysis was used as the primary method for developing a procedure to identify overchargers or underchargers based on their characteristics. Consequently, for the main discriminant analysis, only predictors that were available without having to conduct compliance buys were used. On the other hand, the logistic regression analysis was used primarily to identify variables that were related to overcharging, rather than actually to predict overcharging. In developing this analysis, all vendor variables collected in the study were used as possible predictors, including those that were recorded at the time that the compliance buys were conducted.

The logistic regression analysis did not predict overchargers particularly well--the best model detecting only about 44% of the overchargers. However, it did identify some variables that appear to be related to overcharging, which was the major purpose of this analysis. The variables which were most highly related to overcharging are (1) whether or not a register receipt was issued, (2) whether or not the vendor requested the participant to sign the FI at the right time, (3) whether or not the store had more than five registers, and (4) whether a womens/childrens FI or an infant FI was used. The logistic regression model was unable to predict underchargers.

The discriminant analysis predicted overchargers reasonably well using only variables which were available without entering the store. For the best model (nonparametric) it detected about 45% of the overchargers, and had an overall corrected classification percent of 74%. The variables chosen in the stepwise procedure for this model were (1) number of cash registers, (2) 1990 monthly average redemption amount, (3) the number of items in all three buys, (4) whether or not the FI was a voucher, and (5) whether or not the store was located in a Metropolitan Statistical Area (MSA). No attempts were made to predict underchargers with the discriminant model.

4.1 LOGISTIC REGRESSION RESULTS

The logistic regression procedure was used to predict both overcharging and undercharging. Initially, mischargers were defined as vendors for which the redeemed amount for one or more of the three buys differed from the true (cash) price by any amount, even 1 cent. Depending on which of the two numbers were higher, the vendor was classified as an overcharger or undercharger (or both). In addition, for the analysis of overchargers, regressions were applied to the case for which overcharges had to be at least some minimum amount (i.e., $.10, $.50, or $1.00) for the vendor to be classified as an overcharger.

A large number of predictor variables were used in the analysis in order to identify those variables which were most highly related to vendor overcharging. However, some of the variables were modifications of earlier ones. The basic approach was to use a forward stepwise procedure to identify the most useful predictor variables from a pool of variables,

Table 4.1

Predictor Variables Used for the Logistic Regression Procedure

A. Variables Used in Best-Fitting Model

Variable Name	Definition
REG_RCPT	Equals 1 if the cashier did not provide a register receipt on at least one of the three buys
REQ_SIGN	Equals 1 if the cashier did not request that the investigator sign the FI at the appropriate time on at least one of the three buys
REG_GT5	Equals 1 if the store had 5 cash registers or less
W_C	Equals 1 if the vendor was assigned compliance buys for women's or children's FIs.
ADEQ_STK	Equals 1 if the store did not have all the FI items in stock on at least one of the three buys
BUSY	Equals 1 if the average number of persons in the register line was 5 or more across the three buys
CHECK	Equals 1 if the Food Instrument (FI) was a check
AUTORDR	Equals 1 if the store did not have an automated price reader

B. Other Variables Tested

Variable Name	Definition
IN_LINE	Number of persons in the register line summed across the three buys
NOTBUSY	Equals 1 if there was no one in line for at least one of the three buys
NOTBUSY (alt.)	Equals 1 if the average number of persons in the register line was less than 1 across the three buys
STOR_REG	Number of cash registers in the store
ENTPRICE	Equals 1 if the cashier did not enter the price on the FI at the time of sale for at least one of the three buys
OVERAFTT	Equals 1 if an overcharge occurred even though the amount entered on he FI equalled the amount on the cash register receipt
STMO_TOT	1990 Vendor Monthly Average of Redemption Amounts

based on a weighted logistic regression. The variables included in the pool were those that appeared to be related to mischarging as suggested by the basic tabulations of mischarges by buys and vendors given in Chapter 3.

The predictor variables that were included are given in Table 4.1. Most of these variables are "0" or "1" variables; their definitions are given in terms of the description of the assignment of "1." In creating these variables, the value of "1" was always associated with the category which had a higher percent of overchargers. Consequently, the value of "1" is often associated with a violation or irregularity of some type (e.g., not requesting the signature of the WIC participant).

For many of the basic measures chosen for inclusion in the predictor pool, there are several variations on the definitions of the variables that could have been used. For example, variations on the measures describing the number of cash registers and the cash register lines were considered (see Appendix XI, Section XI.2 for additional discussion). Additional variations of these variables and others used in the analysis could have been tested. However, if all possible variations of variable definitions had been used, the number of distinct sets of predictor variables that would have been required to be addressed becomes quite large. In conjunction with agency staff, a reasonably exhaustive set of variables was used as predictor variables in the logistic regression analysis.

4.1.1 PREDICTING BASIC OVERCHARGERS

The most successful logistic regression model used a prediction pool of eight variables. Table 4.2 provides a summary of the results of the forward stepwise logistic regression for predicting overchargers, using these eight variables. All eight of the variables in the pool were entered into the model in the stepwise procedure.

Table 4.2

Results of Forward Stepwise Logistic Regression

Step	Variable Entered	Mean	Regression Coefficient	Standard Error	P-Value
0	Intercept		-4.25	0.055	0.0
1	REG_RCPT	0.52	1.71	0.038	0.0
2	REQ_SIGN	0.54	1.05	0.032	0.0001
3	REG_GT5	0.61	0.69	0.043	0.0001
4	W_C	0.67	0.71	0.033	0.0001
5	ADEQ_STK	0.17	0.38	0.036	0.0001
6	BUSY	0.02	0.61	0.097	0.0001
7	CHECK	0.61	0.15	0.030	0.0001
8	AUTORDR	0.47	0.13	0.037	0.0004

Since a value of the regression equation greater than zero corresponds to an estimated probability of an overcharger greater than .5, the equation predicts that a vendor is an overcharger if the sum of the regression coefficients for those variables for which the vendor has a value of "1" exceeds the intercept -4.25.

The criteria used to evaluate the effectiveness of each model consisted of success and error rates associated with predictions based on the regression equation. The pertinent data for computing these criteria are given in the following 2 by 2 table which summarizes the prediction results:

Table 4.3

Classification Table for Logistic Regression Predictions

	Predicted		
Actual	Overcharger	Non-overcharger	Total
Overcharger	138	175	313
Non-overcharger	95	757	852
Total	233	932	1165

From Table 4.3, several statistics can be computed. The ones that were used mostly in the evaluation of the model were (1) sensitivity (the proportion of overchargers that were so classified by the procedure), (2) false positive rate (the proportion of cases classified as overchargers that were not), (3) false negative rate (the proportion of cases classified as non-overchargers that were actually overchargers), and (4) the correct rate (the overall percent of cases classified correctly). For the model results summarized in Table 4.2, the four criteria listed above are given in Table 4.4.

Table 4.4

Classification Effectiveness of the Logistic Model

Criterion	Measured Rate
Sensitivity	44.1% (138/313)
False Positives	40.8% (95/233)
False Negatives	18.8% (175/932)
Correct Rate	76.8% [(138+757)/1165]

In addition to looking at Stepwise Logistic Regression, a number of individual regressions were run, typically based on the results of the stepwise regression. Specifically, separate runs were made using as the predictor variables the set of variables identified at each step of the logistic regression process. Typically, the effectiveness of the model did not improve much, if at all, after the first 3-5 variables were used. In fact, for the most successful logistic regression model (summarized above), the effectiveness was slightly higher when only the first four variables chosen in the stepwise procedure (identified in Table 4.2) were used as predictors. The results of this model are given in Tables 4.5 - 4.7.

Table 4.5

Results of Forward Stepwise Logistic Regression
(First Four Predictor Variables Only)

Step	Variable Entered	Mean	Regression Coefficient	Standard Error	P-Value
0	Intercept		-4.12	0.052	0.0
1	REG_RCPT	0.52	1.73	0.037	0.0
2	REQ_SIGN	0.54	1.05	0.031	0.0001
3	REG_GT5	0.61	0.82	0.036	0.0001
4	W_C	0.67	0.73	0.033	0.0001

Table 4.6

Classification Table for Logistic Regression
(First Four Predictor Variables Only)

	Predicted		
Actual	Overcharger	Non-overcharger	Total
Overcharger	145	168	313
Non-overcharger	100	752	852
Total	245	920	1165

Table 4.7

Classification Effectiveness of the Logistic Model
(First Four Predictor Variables Only)

Criterion	Measured Rate
Sensitivity	46.3% (145/313)
False Positives	40.8% (100/245)
False Negatives	18.3% (168/920)
Correct Rate	77.0% [(145+752)/1165]

As is revealed by comparing the criteria values of the effectiveness from Tables 4.4 and 4.7, the four-variable predictor set performs better than does the eight-variable predictor set. The main improvement comes in terms of the sensitivity rate which is two percentage points higher for the four-variable model.

This analysis suggests that the four variables in the reduced set may be the best predictors of overcharging on safe buys. However, with multiple regression, it is difficult to identify the separate effects of the predictor variables. For the "0" or "1" variables, the values of the coefficients give some measure of their relative importance, but the coefficients can be misleading because of the correlations (multi-collinearity) that may exist among the predictor variables. For example, the variable "AUTORDR" may be highly correlated with "REG_GT5." Once "REG_GT5" is added to the equation, there is very little improvement that can be made in estimating the dependent variable by adding the variable "AUTORDR." Therefore, its regression coefficient may be relatively low, even though it may be nearly as highly related to overcharge status as is "REG_GT5."

Another example of the way relationships among the predictor variables may make it difficult to evaluate the usefulness of a specific variable is illustrated by the variable "ENTPRICE." This variable, which relates to violations in entering the price on the FI, was added late to the pool of explanatory variables. Its inclusion actually reduced the overall effectiveness of the regression prediction. However, in the stepwise runs that included "ENTPRICE" in the predictor pool, it was generally selected second. Also, for a test run that included ENTPRICE and eight other variables in the predictor pool, the two variables, "REG_RCPT" and "ENTPRICE," had a much higher sensitivity rate (39.6% vs. 32.9%) than did the full set of nine predictors.

Since the type of FI (women/children vs. infants) seems to be a key factor in overcharging, separate logistic regression runs were made on the subsample of vendors receiving the W/C FIs and on the subsample receiving the infant FIs. The results were striking. With the W/C subsample, the sensitivity of the logistic regression model was 60.2 percent, far better than for any of the other models applied to the entire sample. Furthermore, the model selected only four out of the seven variables in the predictor pool (in the following order): REG_RCPT, REG_GT5, REQ_SIGN, and NOTBUSY. The results of this application are given in Tables 4.8 - 4.10.

Table 4.8

Results of Forward Stepwise Logistic Regression
(Women and Children FI Subsample)

Step	Variable Entered	Mean	Regression Coefficient	Standard Error	P-Value
0	Intercept		-3.62	0.053	0.0
1	REG_RCPT	0.54	1.81	0.043	0.0001
2	REG_GT5	0.61	0.97	0.044	0.0001
3	REQ_SIGN	0.54	0.90	0.036	0.0001
4	NOTBUSY	0.43	0.29	0.037	0.0001
5	AUTORDR	0.47			
6	CHECK	0.62	Not Selected		
7	ADEQ_STK	0.17			

Table 4.9

Classification Table for Logistic Regression Predictions (Women and Children FI Subsample)

Actual	Predicted Overcharger	Non-overcharger	Total
Overcharger	145	96	241
Non-overcharger	100	439	539
Total	245	535	780

Table 4.10

Classification Effectiveness of the Logistic Model (Women and Children Subsample)

Criterion	Measured Rate
Sensitivity	60.2% (145/241)
False Positives	40.8% (100/245)
False Negatives	17.9% (96/535)
Correct Rate	74.9% [(145+439)/780]

Upon comparison of Table 4.10 with Tables 4.4 and 4.7, the model applied to the W/C subsample performs better than the full-sample models in terms of sensitivity, and about the same in terms of the other criteria.

For the logistic regression applied to the infant FI sample, the sensitivity rate was much lower--only 22.2 percent. Overcharging was not as extensive among the infant FIs and cannot be predicted as well as with the other FIs. However, an important result that did come out of the infant logistic regressions was that the variable ADEQ_STK became the second most important variable behind REG_RCPT.

In summary, it does appear that REG_RCPT, REQ_SIGN, and REG_GT5 are related to overcharging. In addition, ENTPRICE and NOTBUSY may also be strong correlates. However, it should be noted that in the case of REG_RCPT, there could be a substantial number of investigator errors made in recording shelf prices when a register receipt was not given even though investigators were trained to record true items prices without relying on the register receipt. If so, many of the observed differences between the redeemed amounts and the corresponding amounts recorded by the investigators could be accounted for by recording errors. In that case, the strength of the relationship between REG_RCPT and overcharging could be exaggerated. Finally, in the case of infant FIs, the variable ADEQ_STK also appears to be related to overcharging (see Appendix X for data regarding rainchecks).

4.1.2 PREDICTING UNDERCHARGERS

The logistic regressions that attempted to predict underchargers from the same pool of variables used to predict overchargers were unsuccessful. The logistic regression run based on the same eight predictor variables that did well in predicting overcharges (listed in Table 4.2) generated an equation that predicted non-overchargers for all vendors. This indicates that the relationships between the predictor variables in the pool and undercharging is not strong enough to predict any undercharging.

As a result, no additional attempts were made to develop models for predicting underchargers.

4.1.3 PREDICTING OVERCHARGERS WHEN THE DEFINITION OF OVERCHARGING WAS MODIFIED

It was speculated that it might be possible to predict overchargers better if mischarging less than a specific cutoff amount (e.g., 10 cents) were ignored. It was thought that such an approach might remove some, or even most, of the random overcharges from the cases identified as overcharges, leaving a large number of intentional overchargers. With random overchargers thinned out, it might be easier to make good predictions of the remaining overchargers since they might have more distinctive characteristics.

Unfortunately, the predictability of overchargers was not improved when cutoffs were used. Cutoffs for defining overchargers of $.10, $.50, and $1.00 were used. It turned out that the higher the cutoff used in the model, the lower was the sensitivity rate. This is due primarily to the fact that the number of overchargers decreased as the cutoff value increased, which made it more difficult for the model to predict overchargers. In addition, the same variables identified in Section 4.1.1 as good predictors of overchargers generally turned out to be the best predictors of overchargers when these cutoffs were used.

For example, for the case of predicting overchargers among only the sample assigned to women's or children's coupon (discussed above) where the sensitivity was 60.2 percent, the sensitivity for the same set of predictor variables for the stepwise pool fell to 44.1 percent when the $.10 cutoff was used. For these two situations, the same set of four variables was chosen (in the same order) as the first four predictors from the predictor pool. For the $.10 cutoff case, the stepwise procedure selected two additional variables from the predictor pool.

There was, however, one interesting result that emerged from the analyses involving various cutoffs. It was hypothesized that the level of redemptions might be a good predictor of overcharges. Therefore, the variable "STMO_TOT" was included in the set of predictors for several of the logistic regression runs. For predicting overcharges of $.01 or more (i.e., including all overcharges), this variable was selected by the stepwise procedure, but not until most of the other variables had been selected. Also, it came in with a positive regression coefficient although it was anticipated that redemption level might be negatively related to overcharging. Then, for predicting overcharges of over $.10, $.50, or $1.00, the stepwise procedure failed to select "STMO_TOT."

Although it cannot be proved from the study data, the results suggest that redemption level is slightly related (positively) to overcharging due to the random component of overcharging. That is, the higher the amount of WIC redemptions, the higher random

overcharging is since the level of random overcharging may be approximately equal to a constant proportion of total redemptions. Thus when a large part of the random overcharges were eliminated by using cutoffs, WIC redemption level was no longer useful as a predictor of overcharging.

4.2 DISCRIMINANT ANALYSIS RESULTS

The discriminant analysis model was used as the primary tool for classifying vendors as overchargers or non-overchargers. The main focus of the discriminant analyses was to classify vendors on the basis of characteristics that were available prior to entering the store. However, the model was also applied using a full set of predictor variables similar to those used for the logistic regression analysis.

4.2.1 PREDICTION BASED ON VARIABLES AVAILABLE PRIOR TO ENTERING THE STORE

A pool of six variables was used to predict abusing vendors from those characteristics that were available without having to enter the store. These six variables, most of which were included in the set of predictors listed in Table 4.1 for logistic regression, are listed in Table 4.11. For the "0" or "1" variables, the definition of the assignment of "1" is given.

Table 4.11

Predictor Variables Used for the Discriminant Analysis

Variable Name	Definition
STOR_REG	Number of cash registers in the store
AUTORDR	Equals 1 if the store did have an automated price reader
VOUCHER	Equals 1 if the Food Instrument (FI) was a voucher
STMO_TOT	1990 Vendor Monthly Average of Redemption Amounts
ITEM_TOT	Number of items in all three buys
METRO (MSA)	Equals 1 if the store was located in a Metropolitan Statistical Area

The discriminant analysis method allows a choice of either a parametric or nonparametric model. The parametric model is based on the assumption that the predictor variables have a multivariate normal distribution. Since there were a number of "0" or "1" predictor variables included in the model, this assumption would not be appropriate. Therefore, a nonparametric model was selected for the discriminant analysis.

The specific nonparametric method chosen was the "nearest-neighbor" method. With this procedure, whether or not a vendor is predicted to be an overcharger is based on the proportion of overchargers among the k "closest" sample cases. The "distance" between a vendor and a sample case is based on the differences between the values of the predictor

variables for the vendor and sample case (see Appendix XI, Section XI.3 for more discussion). If a majority of the k "nearest" sample cases are overchargers, the vendor is classified as an overcharger; otherwise, the vendor is classified as a non-overcharger. Therefore, the nonparametric procedure did not actually use a discriminant function in the way the parametric method would have.

For the final model, k=11 was used. A discussion of this choice, including some comparisons of results for another model with k=11, is provided in Section XI.3 of Appendix XI.

The discriminant analysis was performed in two major steps. First, a stepwise discriminant analysis was run to select the best predictors from the pool of six given in Table 4.11 for predicting overcharges. The stepwise run selected five of these six variables (i.e., all except AUTORDR) as being useful predictors. Then the regular discriminant analysis procedure was run using this set of predictor variables and the nonparametric model.

The discriminant analysis was run both on the full sample and half the sample. The analysis was run on a random half of the sample so that the other half could be used for testing purposes. Also, the discriminant analysis was run with the roles (i.e., development and assessment) of the two half samples "swapped." Although some runs were made with unweighted data, the primary runs were on weighted data so that the oversampling of smaller stores would be properly reflected.

For the first half-sample development set, the sensitivity was 46 percent;17/ for the test half-sample, the sensitivity was 44.6 percent. This compares very favorably with the results from the logistic regression when more predictor variables were used.

The basic classification results and assessment measures, which are the same as those used for logistic regression in Section 4.1, are given in Tables 4.12 and 4.13.

Table 4.12

Classification Table for Discriminant Analysis
(First Half-sample Test)

	Predicted		
Actual	Overcharger	Non-overcharger	Total
Overcharger	62	77	139
Non-overcharger	78	379	457
Total	140	456	596

17/Although a few of the statistics for the development half-samples are quoted in the text, classification results are given in accompanying tables only for the test half-samples.

Table 4.13

Classification Effectiveness for Discriminant Analysis (First Half-sample Test)

Criterion	Measured Rate
Sensitivity	44.6% (62/139)
False Positives	55.7% (78/140)
False Negatives	16.9% (77/456)
Correct Rate	74.0% (379+62)/596

When the half sample roles were reversed (Tables 4.14 and 4.15), the sensitivity rates for both the development and test samples fell off considerably -- from 46% to 24% for the development half-samples and 44.6% to 15.5% for the test half-samples. However, the overall correct classification rate was about the same (i.e., 73.5% for the test sample). The reason that the sensitivity was so much lower for the second test sample is that the second development sample has a substantially lower percent of overchargers (23.4%) than does the first development sample (30.4%), even though these are random half samples. The more overcharge cases that appear in the development sample, the better the chance of identifying overchargers in the test sample.

The full sample classification results are given in Tables 4.16 and 4.17. Even though the sensitivity rate for the full-sample model is not as high as for the first development sample (i.e., 35.1% vs. 46.0%), the overall correct rate is slightly higher (i.e., 78.5% vs. 77.3%, as would be expected).

Since sensitivity is probably the most important factor in choosing a discriminant model for identifying overchargers, the model based on the first half sample is the best. However, because it is a nonparametric model, there is no linear discriminant function to use for prediction. Instead, the entire half-sample data set of 573 cases would have to be used to classify new cases, using the nearest neighbor method with k=11.

Because of the emphasis on identifying overchargers, and the unsuccessful attempts to predict underchargers in the logistic regression analysis, no attempts were made to use the discriminant analysis to predict underchargers.

4.2.2 PREDICTION BASED ON A FULL SET OF VARIABLES

Even though the discriminant analysis was investigated primarily as a method for identifying overcharge vendors based on variables that are available without entering the store, the discriminant analysis was also conducted for a larger set of variables that included most of the variables used in the logistic regression analysis. Many of these variables require entering the store to measure. Specifically, the pool of variables for which the stepwise procedure was applied is given in Table 4.18.

Table 4.14

Classification Table for Discriminant Analysis
(Second Half-sample Test)

	Predicted		
Actual	Overcharger	Non-overcharger	Total
Overcharger	27	147	174
Non-overcharger	5	394	399
Total	32	541	573

Table 4.15

Classification Effectiveness for Discriminant Analysis
(Second Half-sample Test)

Criterion	Measured Rate
Sensitivity	15.5% (27/174)
False Positives	15.6% (5/32)
False Negatives	27.2% (77/456)
Correct Rate	73.5% (394+27)/573

Table 4.16

Classification Table for Discriminant Analysis
(Full Sample)

	Predicted		
Actual	Overcharger	Non-overcharger	Total
Overcharger	110	203	313
Non-overcharger	48	808	856
Total	158	1011	1169

Table 4.17

Classification Effectiveness for Discriminant Analysis
(Full Sample)

Criterion	Measured Rate
Sensitivity	35.1% (110/313)
False Positives	30.4% (48/158)
False Negatives	20.1% (203/1011)
Correct Rate	78.5% (808+110)/1169

Table 4.18

Predictor Variables Used for the Full-Predictor-Variable Discriminant Analysis

Variable Name	Definition
AUTORDR	Equals 1 if the store did not have an automated price reader
VOUCHER	Equals 1 if the Food Instrument (FI) was a voucher
STMO_TOT	1990 Vendor Monthly Average of Redemption Amounts
ITEM_TOT	Number of items in all three buys
METRO	Equals 1 if the store was located in an MSA
REG_GT5	Equals 1 if the store had more than 5 registers
REQ_SIGN	Equals 1 if the cashier did not request that the investigator sign the FI at the appropriate time on at least one of the three buys
REG_RCPT	Equals 1 if the cashier did not provide a register receipt on at least one of the three buys
ADEQ_STK	Equals 1 if the store did not have all the FI items in stock on at least one of the three buys

The predictor pool included all the variables used for the primary discriminant analysis except that STOR_REG was replaced by REG_GT5. In addition, three more predictor variables used in the logistic regression analysis were added at the request of FNS.

When the stepwise discriminant analysis was applied to the set of nine predictors listed in Table 4.18, seven of them were chosen to use in the regular discriminant program--all except AUTORDR and STMO_TOT.

It is interesting that this expanded set of predictors did not improve the prediction rates of the discriminant model as compared to the model that uses fewer predictors discussed in the previous section. The sample classification rates for the first half sample model and the full sample model are given in Tables 4.19 - 4.22 for this expanded model.

Comparing the results for the expanded model given above with the corresponding results for the basic model given in Tables 4.12, 4.13, 4.16, and 4.17, demonstrates that the effectiveness of the basic model and the effectiveness of the expanded model are similar. The sensitivity rate is somewhat higher in the expanded model for both samples; however, the overall correct rate is somewhat lower in the expanded model for both samples.

It was unexpected that the discriminant analysis model would be able to classify vendors as overchargers or non-overchargers about as well when the limited set of predictors was used (Table 4.2) as when the full set of predictors (Table 4.18) was used. This suggests that the variables measured by the investigators after entering the store do not improve much the model's effectiveness in classifying vendors.

Table 4.19

Classification Table for Discriminant Analysis
(First Half-Sample Test, Expanded Model)

	Predicted			
Actual	Overcharger	Non-overcharger	Other*	Total
Overcharger	65	61	13	139
Non-overcharger	75	357	23	455
Total	140	418	36	594

*Signifies cases which are assigned a probability of .5 for membership in each group (ties). No ties occurred for the previous model (Table 4.11).

Table 4.20

Classification Effectiveness for Discriminant Analysis
(First Half-Sample Test, Expanded Model)

Criterion	Measured Rate
Sensitivity	46.8% (65/139)
False Positives	53.6% (75/140)
False Negatives	14.6% (61/418)
Correct Rate	71.0% (357+65)/594

Table 4.21

Classification Table for Discriminant Analysis
(Full Sample, Expanded Model)

	Predicted			
Actual	Overcharger	Non-overcharger	Other*	Total
Overcharger	118	184	11	313
Non-overcharger	66	781	6	853
Total	184	965	17	1166

*Signifies cases which are assigned a probability of .5 for membership in each group (ties)

Table 4.22

Classification Effectiveness for Discriminant Analysis
(Full Sample, Expanded Model)

Criterion	Measured Rate
Sensitivity	37.7% (118/313)
False Positives	35.9%% (66/184)
False Negatives	19.1% (184/965)
Correct Rate	77.1% (781+118)/1166

CHAPTER 5:
SUMMARY

5.0 SUMMARY

The WIC Vendor Issues study fulfilled its objective to develop a national-level data base and an estimate of select types of vendor abuse for a group of vendors who had participated in the program for at least 12 months. This group comprised nearly 80% of the WIC vendor population reported by the states in the fall of 1990. The 12 month lag experienced between the time the states were asked for their lists of authorized retailers and the drawing of the sample was due to the time required to build the sampling frame. The data base developed from this national compliance buy survey will be available to evaluate the impact of future program changes and management initiatives on certain types of vendor abuse. This study does not provide an estimate of program loss from all types of vendor abuse.

Magnitude of mischarging

Based on the three safe compliance buys carried out for each of the sample vendors during the summer of 1991, the magnitude of the overcharging was considerably more modest than expected: an estimated 1.9 percent of WIC's retail redemptions at the stores represented by the sample, or a total of $39.5 million. The estimated percent of dollars affected by overcharging in safe buys averaged 1.9 percent, varying from as low as 0.3 to as high as 4.7 percent, depending on the subgroup. As anticipated, the estimates indicate that there is more overcharging among smaller stores (one to five registers) than among large stores (six or more registers) ranging in amounts from $6.9 million (0.5% of redemptions) for large vendors up to $32.6 million (3.9% of redemptions) for small vendors.

In addition, a sizable amount of this overcharging is offset by undercharging, a phenomenon which occurred in about 17 percent of the vendor population. These undercharges, which were too large to be considered random processing errors, were estimated to be on the order of 0.6 percent of WIC's retail redemptions at these stores or a total of $11.9 million. Unfortunately, insufficient data were available to determine why such a large number of vendors would undercharge the program.

The occurrence of such a large amount of undercharging complicated the calculation of the estimated total dollar loss due to systematic overcharging. It was originally thought that all of the undercharging would be the result of random processing error and would serve as a reasonable measure of the random processing error component in the overcharging estimate. However, since the level of undercharging seems too high to assume that it occurred randomly, it was impossible to estimate the random component of overcharging. Therefore data describing mischarging have been presented either as gross mischarging (both overcharging and undercharging) or net overcharging, where the gross undercharges have been subtracted from the gross overcharging. No estimates relating to systematic overcharging have been made.

Incidence and rate of mischarging

It is estimated that approximately 22 percent (i.e., about 7,500) of the 34,033 vendors represented in the study would overcharge a WIC participant on at least one of three safe buys during the summer of 1991.18/ This number falls well below the 76 percent figure suggested by the OIG audit results published in 1988. In terms of vendor size, an estimated 6,052 (29%) of small vendors overcharged as compared to 1,512 (11.5%) of the large vendors.

In addition, significant (5% level) differences in both dollars and incidence were noted in overcharging for women's and children's food instruments than for infant's coupons--$30.3 million (2.4% of redemptions) vs. $9.2 million (1.1% of redemption) and 5,871 (25.8%) vs. 1,693 (15%).

Prevalence of Program Violations

The prevalence of various types of WIC Program violations varied considerably in frequency. As anticipated, stores with one to five registers appear to be more apt to commit multiple offenses in numbers that are significantly greater than those occurring in stores with six or more registers. Rates are at least double for vendor initiated substitutions, failing to maintain adequate stock, and failing to record the purchase price.

Vendor-initiated substitutions, requiring WIC participants to use a specific register, altering the purchase price on the FI, requesting additional cash payment, offering credit or cash for other FIs, maintaining a special WIC register, or brand restriction violations occurred infrequently. Each of these is estimated to have occurred with less than six percent of the vendors. The program violation that appears to be encountered with significant frequency is running out of stock. This violation is estimated to have occurred with 17 percent of the vendors for at least one of three safe buys. Stores with one to five registers appear to be more apt to run out of stock than stores with six or more registers.

The most frequently encountered program violation was failure to request an identification card from the participant. This violation was noted in vendors who did not over or undercharge with about the same frequency as with vendors who either overcharged or undercharged. Therefore, not requesting to see an ID card does not seem to be related to the incidence of program abuse.

Incidence of overcharging was also analyzed at the buy level to determine whether a vendor is more apt to overcharge after the participant is recognized as a repeat customer. Study data showed that short-term familiarity with a WIC Program participant for three-to-five buys did not significantly affect a vendor's decision to overcharge. Neither did familiarity appear to influence the degree of overcharging committed. Program offenses also did not appear to increase in number through transactions with familiar WIC participants.

This study also suggests that generally speaking, overcharging vendors do not attempt to hide the fact that they are overcharging the participant, as the majority of them entered

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18/In addition to the variation due to sampling error, this estimate may differ from the population parameter being estimated because (a) random overcharges are included in the estimate, and (b) some of the sample vendors who did not overcharge on any of the three compliance buys may still have overcharged on some of their participant transactions during 1991.

the overcharge on the FIs at the time of purchase. Approximately 10% of overcharging vendors who entered a price at the time of purchase were estimated to alter the FIs after the buy was completed. Assuming that vendors who overcharge would prefer that the participant was unaware of it, this suggests that vendors who overcharge believe that participants do not pay attention to the amount that the cashier enters on the FI.

Multivariate analyses

In addition, a series of multivariate analyses were conducted, in an attempt to develop models which might be useful in classifying and/or predicting abusive vendors.

The logistic regression procedure was used to predict overcharging and undercharging. The results from this study suggest that not receiving register receipts, not requesting the participant to sign the FI at the appropriate time, and small numbers of cash registers (1-5) are related to overcharging. The logistic regressions that attempted to predict undercharges from the same pool of variables used to predict overcharges were unsuccessful.

The discriminant analysis failed to identify a discriminant function to use for prediction. This is due to the fact that selected predictor variables did not have multivariate normal distributions. A nonparametric discriminant model was developed which performs reasonably well as a predictor of overcharging using variables which can be obtained without a visit to the vendor.

APPENDIX I:

SUMMARY OF PROCEEDINGS, WIC VENDOR ISSUES ADVISORY PANEL MEETING

Applied Management Sciences

A Subsidiary of Aspen Systems Corporation

M E M O R A N D U M

TO: Dr. Steven K. Gale, Office of Analysis and Evaluation, Food and Nutrition Service

FROM: Donald G. Smith, Applied Management Sciences

SUBJECT: Summary of Proceedings, WIC Vendor Issues Advisory Panel Meeting

DATE: October 23, 1990

The WIC Vendor Issues Advisory Panel met with the WIC Vendor Issues study team and representatives of the Food and Nutrition Service to provide technical and practical guidance on key issues in study design and implementation. The meeting was convened at Food and Nutrition Service (FNS) headquarters on October 16, 1990. Meeting participants discussed four areas in which the WIC Vendor Issues study team had requested the Panel's guidance: the compliance buy methodology, compliance buy implementation, sample design and estimation, and acquisition of data from WIC State Agencies. This memorandum provides a summary of issues addressed and agreements reached during the meeting. A list of meeting participants is attached to the memorandum.

Compliance Buy Methodology

The Panel approved the design for the compliance buy methodology overall, including the emphasis on developing an estimate of the incidence and dollar loss from overcharging through the use of safe buys. Special consideration was given to the following aspects of the design:

- Compliance Buy Sequence. The study team has proposed that investigators conduct four compliance buys for each vendor in a national probability sample of 1200 vendors. As proposed, the sample will be divided into three groups for subsample selection, systematic within substrata, for the fourth buy. Vendors in one group will receive a sequence of four safe buys, vendors in a second group will receive a sequence of three safe buys and an investigator-initiated omission, and those in a third group will receive a sequence of three safe buys and an investigator-initiated major substitution. The Panel approved the concept of a variable compliance buy sequence to test for different types of offenses, but questioned the inclusion of an investigator-initiated omission as one of the compliance buy types.

- Use of an Investigator-initiated Omission. In the compliance buy methodology, an investigator-initiated omission is a compliance buy in which one food item specified on the WIC food instrument (FI) is omitted. The investigator purchases all other food items on the FI in the exact quantity specified. Inclusion of vendor response to this type of buy in the basic national estimate would require empirical data on the proportion of WIC participants that omit items from their WIC purchases. Information on WIC participant purchasing behavior is not available, however. A single weighted estimate for vendor response to investigator-initiated omissions cannot be developed, therefore. While the incidence of vendors in the sample that allow an investigator-initiated omission and commit an overcharge can be used to develop a series of estimates of the proportion of vendors that commmit this offense nationally,these estimates would be based, necessarily, on varying speculation about the proportion of such buys that occur in the actual WIC population. The Panel advised that the investigator-initiated omission not be included in the compliance buy methodology because of the uncertainty concerning participant purchasing behavior, and for other reasons:

  -- A vendor may overcharge the WIC program when allowing an omission by greater or lesser amounts, depending on the food item that is omitted. An estimate of dollar loss from overcharges committed in response to an investigator-initiated omission would have to include assumptions about this aspect of the WIC purchase, in addition to speculation about the proportion of WIC participants that omit items.

  -- Inclusion of estimates based on assumptions or speculation in a study intended for a national audience may cause unintended harm to the WIC program, even if it is presented separately, in an appendix. The information would be available and may be misinterpreted by users of the study who do not carefully examine the limitations placed by the authors on study findings.

  -- The experience of many WIC vendor coordinators suggests that WIC participants purchase all items on the food instrument, all of the time. If an unknown person omits items listed on the food instrument during a WIC purchase, the vendor may become suspicious and realize that a compliance buy is being performed.

The WIC Vendor Issues study team and FNS representatives concluded that the estimate of vendor response to investigator-initiated omissions should be developed when more information is available concerning participant purchasing behavior. They accepted the Advisory Panel's recommendation. An investigator-initiated omission will not be included in the compliance buy methodology.

To replace the omission buy, several alternatives were suggested, including enhancing the precision of the sample estimate by including more safe buys or including another major substitution, enhancing the training plan for investigators, or including a buy to test for purchase of the appropriate brand of infant formula.

- Use of Major Substitutions. In the compliance buy methodology, a major substitution is a compliance buy in which an unauthorized food is purchased in place of an authorized WIC food listed on the food instrument. All other items listed on the food instrument are purchased in exactly the quantities specified. Because information on WIC participant purchasing behavior is incomplete, the national estimate of the incidence of this offense in the vendor population also will be based on speculation about the proportion of WIC participants who attempt it, and will be presented in an appendix to the study's final report.

The Panel agreed to inclusion of a major substitution in the compliance buy methodology, however, because the intent of both the investigator and the vendor is clear. Measurement of vendor abuse, therefore, will be more valid and reliable for this type of compliance buy than for investigator-initiated omission. The Panel also approved selection of a six-pack of a widely distributed cola soft drink as the substitute food to be purchased, in place of fruit juice, since the cola is likely to be found in every type of store selected in the sample.

- Compliance Buy Specifications. The study team has proposed that the food instruments used in the four compliance buys for each sampled vendor represent the food package purchased most frequently on a monthly basis in each of the sampled states. In sampled states that issue fewer than four food instruments per month, the food package purchased most frequently by two or more participant types on a monthly basis would be used for compliance buys. The distribution of participants in these states will be considered in selecting the participant types. One Panel member suggested that this approach will not yield compliance buy food purchases that are representative of the WIC food purchased in the nation. As an alternative, the Panel member proposed that the distribution of food packages purchased during compliance buys should reflect the distribution of participant types in each sampled state. One FNS representative proposed that national averages for the distribution of participants would serve the study's purpose.

The WIC Vendor Issues study team will select an alternative to the use of an investigator-initiated omission in one of the compliance buy sequences, through consultation with FNS, and present it to Panel members for consideration. The issue of food package distribution in the compliance buy specifications also will be reconsidered.

Compliance Buy Implementation

The Panel considered the plan for training investigators and for field operations. They agreed that selected features of the plan will be conducted as follows:

- Senior investigators, who will train investigators assigned to local offices in the compliance buy methodology, should have experience conducting WIC compliance buys, regardless of prior investigative experience. Senior investigators will obtain this experience by conducting compliance buys in the Washington, DC metropolitan area during their training session.

- The investigator training manual will emphasize performing the compliance buy protocol correctly. Investigators will be assured that their success will not be measured by the number of offenses they detect during compliances buys.

- One investigator is sufficient to conduct compliance buys in most of the stores that will be selected in the sample. In the neighborhoods and stores of high risk vendors where the crime rate may be high, the Pinkerton's will develop strategies for protecting their investigators.

- Use of the simplified version of the Compliance Buy Outcome Report will streamline assembly of compliance buy materials for investigators during field operations. The increased cost for data preparation and processing that may be incurred through the use of a write-in format for purchase and price information will be minimized through focused training of investigators, and thorough quality control of training sessions and field operations.

- Investigators will record purchase and price information for items purchased with cash during compliance buys on the simplified Compliance Buy Outcome Report. A code also will be added to the simplified version of the Report to account for investigator-initiated major substitutions in which the attempted substitution was not allowed, but purchase of another unauthorized food item was permitted.

- Most WIC vendors also participate in the Food Stamp program. Many conduct WIC transactions in an environment in which an undercover investigation may be taking place at any time, for either the Food Stamp program, WIC, or as a joint investigation. Potential contamination of WIC Vendor Issues study compliance buys by other on-going investigations will not be considered an issue, therefore. WIC State Agencies selected in the study sample will not be asked to suspend their investigations during field implementation of WIC Vendor Issues compliance buys.

The Panel considered all other aspects of the compliance buy implementation plan appropriate.

Sample Design and Estimation

The Panel considered and approved the approach to sampling represented by the multistage cluster sample design proposed for the study, including the use of a weighting procedure to preserve the representativeness of the sample, when other than large chain stores are oversampled. The Panel also approved the proposed estimation procedure. Panel members were advised that if a ratio estimation technique is used, WIC State Agencies in the sampled states will be asked to provide redemption volume for the sampled vendors for the time period that compliance buys are conducted, and total redemption volume for the state. It was agreed that anomalous vendors, such as WIC-only stores located in the southwest and Florida, are properly dealt with in the sampling approach.

Acquisition of Information from the WIC State Agencies

The Panel reviewed the list of information and materials that will be requested during the remainder of the study from WIC State Agencies responsible for vendors selected in the sample. Panel members concluded that the greatest amount of effort will be required to issue food instruments for the compliance buys, but that the total burden is tolerable. On the advice of the Panel, the study team will notify all WIC State Agencies, prior to sample selection, that redemption volume for sampled vendors, a list of vendors identified as high risk during the time period that compliance buys are conducted, and the indicators used to identify them, will be requested at a later time, to ensure that the information is available when it is needed.

WIC VENDOR ISSUES STUDY

ADVISORY PANEL MEETING

October 16, 1990

Participants

Panelists	FNS	AMS
John Harrison, FL	Steven Gale	Donald Smith
Henry Klimek, LA	Debbie McIntosh	Sara Edmondson
Jack Metz, TX	Kenneth Offerman	Howard Garrison
Colleen Pearce, ND	Ronald Vogel	Steven Frost
Gary Seig, OH		Joseph Steinberg
		Linda Yates

APPENDIX II:

COMPLIANCE BUY OUTCOME REPORT COVER SHEET AND FORM

APPENDIX II

OMB Clearance No. 05840404
Expiration: 09-30-91

COMPLIANCE BUY OUTCOME REPORT

COVER SHEET

COMPLETE THIS PAGE BEFORE YOU TRAVEL TO THE STORE:

Investigator:

Last Name_____ First Name_____M.I.__

Investigator ID Number: __ __ __ __ __ __ __ __

Second Investigator: Last Name_____ First Name_____M.I.__

Second Investigator ID Number: __ __ __ __ __ __ __ __

Date of Buy: _____/_____/_____
Month Day Year

Day of Week of Buy: _____

Time of Buy: ___ ___: ___ ___ AM PM

Assigned Purchase:

Vendor Name: _____

Vendor Address: Street_____

City_____ State _____ ZIP __ __ __ __ __

Vendor ID Number: ___ ___ ___ ___

Food Instrument Serial Number: ___ ___ ___ ___ ___ ___ ___ ___ ___

Supplemental Purchase Record Attached? _____ Yes _____ No

Transaction Number: __ __ __ __ - __ __

Investigator 1 Initials _____
Date _____

Investigator 2 Initials _____
Date _____

PART 1: PURCHASE RECORD

Complete Questions 1,2,3, and Column A of #4 Prior to the Compliance Buy. Complete the remainder of Parts 1, 2, and 3 as soon as practical after the compliance buy.

1. Transaction Number: _ _ _ _ _ - _ _
2. Food Instrument Serial Number: _ _ _ _ _ _ _ _ _ _
3. Compliance Buy Type: 1... Safe
   (CIRCLE ONE NUMBER) 2... Major Substitution
4. Record the information requested in the box below for all items specified on the WIC food instrument, and all items purchased with the WIC food instrument.

COLUMN A			COLUMN B				C	D	E		F
ITEMS SPECIFIED ON WIC FOOD INSTRUMENT			ITEMS PURCHASED WITH WIC FOOD INSTRUMENT				ITEM CODE (SEE BELOW)	RECEIPT PRICE DATA	SHELF PRICE DATA		PRICE DATA CODE (SEE BELOW)
Quantity	Size	Item Desc. (Food Code)*	Quantity	Size	Brand	Item Desc. (Food Code)*			Unit	Total	
								$	$	$	
							Total				

*FOOD CODES - Enter appropriate code from the WIC Food Codes List.

ITEM CODES

(ENTER ALL CODES THAT APPLY)
- E - Eligible item purchased in quantity and size required.
- 01 - Item omitted reason: not in stock.
- 02 - Item omitted reason: total quantity needed not in stock.
- 03 - Item omitted reason: required size not in stock.
- 04 - Vendor suggested alternate item.
- S1 - Ineligible item substituted for required item and purchase allowed by vendor.
- S2 - Vendor refused to allow attempted substitution.

PRICE DATA CODES

(ENTER ONE CODE FOR EACH ITEM)
- M - Price Marked on Item
- O - Price Observed in store
- CP - Second investigator obtained price through cash purchase
- TC - Price obtained by telephone call

Investigator 1 Initials _____
Date _____

Investigator 2 Initials _____
Date _____

PART 1: SUPPLEMENTAL PURCHASE RECORD

Complete Questions 1,2,3, and Column A of #4 Prior to the Compliance Buy. Complete the remainder of Parts 1, 2, and 3 as soon as practical after the compliance buy.

1. Transaction Number: _ _ _ _ _ - _ _
2. Food Instrument Serial Number: _ _ _ _ _ _ _ _ _ _
3. Compliance Buy Type: 1... Safe
   (CIRCLE ONE NUMBER) 2... Major Substitution
4. Record the information requested in the box below for all items specified on the WIC food instrument, and all items purchased with the WIC food instrument.

COLUMN A			COLUMN B				C	D	E		F
ITEMS SPECIFIED ON WIC FOOD INSTRUMENT			ITEMS PURCHASED WITH WIC FOOD INSTRUMENT				ITEM CODE (SEE BELOW)	RECEIPT PRICE DATA	SHELF PRICE DATA		PRICE DATA CODE (SEE BELOW)
Quantity	Size	Item Desc. (Food Code)*	Quantity	Size	Brand	Item Desc. (Food Code)*			Unit	Total	
								$	$	$	

(Part 1 -- Continued)

CASH PURCHASE RECORD

5. List all non-WIC items purchased with cash during the compliance buy in the box below and record the information requested.

ITEMS PURCHASED WITH CASH DURING THE COMPLIANCE BUY				RECEIPT PRICE DATA	SHELF PRICE DATA		PRICE DATA CODE
Quantity	Size	Brand	Item Description		Unit	Total	
				$	$	$	
			Total				

PRICE DATA CODES

(ENTER ONE CODE FOR EACH ITEM)
M - Price Marked on Item
O - Price Observed in store
CP - Second investigator obtained price through cash purchase
TC - Price obtained by telephone call

Investigator 1 Initials _____
Date _____

Investigator 2 Initials _____
Date _____

(Part 1--Continued)

6. Date of Price Check _____/_____/_____
Month Day Year

7. Day of Week of Price Check _____

8. Time of Price Check _____ : _____ AM PM

9. How many registers did the store have for all customers? (CIRCLE ONLY ONE NUMBER)

1	1 Register	6	6 Registers	11	11 Registers
2	2 Registers	7	7 Registers	12	12 Registers
3	3 Registers	8	8 Registers	13	13 Registers
4	4 Registers	9	9 Registers	14	14 Registers
5	5 Registers	10	10 Registers	15	More Than 14 Registers

10. How many registers were open for all customers? (CIRCLE ONLY ONE NUMBER)

1	1 Register	6	6 Registers	11	11 Registers
2	2 Registers	7	7 Registers	12	12 Registers
3	3 Registers	8	8 Registers	13	13 Registers
4	4 Registers	9	9 Registers	14	14 Registers
5	5 Registers	10	10 Registers	15	More Than 14 Registers

11. Did the register used for your WIC purchase have an automated price reader?

1..... Yes
2..... No

STAPLE REGISTER RECEIPTS HERE:

WIC Purchase Receipt

Cash Purchase Receipt

Investigator 1 Initials _____
Date _____

Investigator 2 Initials _____
Date _____

PART 2: DESCRIPTION OF TRANSACTION

Please describe what happened in the store during the compliance buy.

(CIRCLE ONE NUMBER FOR EACH QUESTION)

1. All of the WIC food listed on the food instrument was available in required quantities and sizes.

   1..... Yes
   2..... No

2. I was asked to accept another item in substitution for the WIC foods I attempted to purchase:

   1..... Yes
   2..... No

3. The cashier verified that I had my WIC identification card.

   1..... Yes
   2..... No

4. I was provided with a register receipt for the WIC purchase.

   1..... Yes, $_____._____ Amount on Register Receipt (ATTACH ON PAGE 3).
   2..... No

5. The cashier entered the purchase price on the WIC food instrument.

   1..... Yes, $_____._____ Amount Clerk Entered.
   2..... Yes, Could Not Read Amount Entered
   3..... No

6. I was asked to countersign the WIC food instrument.

   1..... Yes, before the cashier rang up the WIC food items
   2..... Yes, after the cashier rang up the WIC food items, but before the price was entered on the food instrument
   3..... Yes, after the purchase price was entered on the food instrument
   4..... No

7. I was asked to pay cash for WIC food in addition to the food instrument purchase price.

   1..... Yes, $__.__ Amount Paid.
   2..... No

Investigator 1 Initials _____
Date _____

Investigator 2 Initials _____
Date _____

(Part 2--continued)

8. I was asked if I had any more WIC food instruments and was offered credit or cash for them.

   1..... Yes, $_____.___ Amount of Cash or Credit Offered
   2..... No

9. I was asked to take my purchase to a register for WIC participants.

   1..... Yes
   2..... No

10. I was advised that I could purchase only certain brands of food.

   1..... Yes
   2..... No

11. I observed an offense or violation of WIC program requirements, other than those listed above.
(SPECIFY)_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

Investigator 1 Initials _____
Date _____

Investigator 2 Initials _____
Date _____

PART 3: EVIDENCE

I, _____, employed by Pinkerton, Inc. and representing the U.S. Department of Agriculture, hereby make the following statements freely and voluntarily, knowing that this statement may be used as evidence. I entered the establishment listed on the first page of this document on the date listed on the first page and attempted to purchase the items listed. Before the check-out process I informed the clerk that I would be using WIC food instruments for the items selected. The events indicated by the entries in Parts 1, 2 and 3 of the form occurred. Additional observations are provided below.

1. The cashier who served me had the following characteristics: (CHECK THE APPROPRIATE ITEMS)

   a. Sex _____ Male _____ Female

   b. Ethnic Background _____ White _____ Black _____ Asian _____ Hispanic _____ Other (SPECIFY) _____

   c. Age _____ Years

   d. Height _____ Feet _____ Inches

   e. Weight _____ Lbs.

   f. Hair color _____ Blonde/Light _____ Red _____ Brown _____ Black

   g. Other identifying information _____

_____.

2. When I joined the cashier's line there were (WRITE IN A NUMBER):

   _____ People in front of me

   When the cashier began ringing up the purchase, there were (WRITE IN A NUMBER):
   _____ People in line behind me.

3. Briefly describe the offenses indicated by entries in Parts 1 and 2 of this document. Include a discussion of anything else that happened that is inconsistent with the intent and purpose of the WIC Program. Refer to item numbers on previous pages, if appropriate.

_____

_____

(Writing space continued on next page)

Investigator 1 Initials _____
Date _____

Investigator 2 Initials _____
Date _____

(Part 3--Continued)

(Writing space for Question 3 continued)

4. This declaration consists of _____ pages. I have initialed each page. The facts stated in this declaration are true to my knowledge. If I am called to testify as a witness in any proceeding, I am competent to testify to the matters stated herein. I declare under penalty of perjury the foregoing is true and correct.

EXECUTED BY:

_____
PRINT NAME

_____
SIGNATURE

_____/_____/_____
MONTH DAY YEAR

Investigator 1 Initials _____
Date _____

Investigator 2 Initials _____
Date _____

CERTIFICATION OF ITEMS DONATED

This will certify that I, _____, donated the following items to:

Organization _____

Address _____

_____

Organizational Representative _____

Telephone Number ( ) _____

Description of Donated Items:

Quantity	Size	Brand Name	Item

Remarks: _____

_____

_____

Transaction Number: _____

_____
Person Donating Items

_____
Date

_____
Person Receiving Donated Items

_____
Title

_____
Date

APPENDIX III:

OUTLINE OF TRAINING METHODOLOGY

Appendix III

OUTLINE OF TRAINING METHODOLOGY

Introduction

Selection and training of the study's primary data collectors were critical to the study's purpose. These tasks were divided between Aspen and its subcontractor, Pinkerton Inc. The subcontractor was responsible for mobilizing a group of area supervisors for the 30 States selected in the sample. These supervisors later identified additional investigators who would be used as data collectors. During this period, a copy of the vendor sample (broken out by State) was provided to Pinkerton. Pinkerton was requested to provide preliminary information about the selected stores as well as potential "participant" names. These names were to be used when Aspen ordered WIC food instruments for the buys.

Aspen was responsible for designing, developing, and carrying out the training curriculum. A two-tiered training program was developed in order to reduce training costs and keep training group size small. Centralized training of all Pinkerton area supervisors was conducted by Aspen staff in and around Norfolk, Virginia. Immediately thereafter the area supervisors returned to their field offices where they trained the other investigators in their area using materials provided by Aspen.

In all, nineteen (19) senior investigators and one hundred thirty-nine (139) investigators were trained in the two-week period between May 20, 1991 and June 4, 1991. Successful completion of the training program was required of all investigators prior to their conducting buys. Of the 134 investigators completing compliance buys, 118 were female and 16 were males. Male investigators were assigned buys in the same manner as females.

One of the challenges of the study design was to integrate undercover investigative method successfully with the fundamentals of data collection quality control. The design of the data collection instrument, the training of investigators, the logistics of food instrument assignment, as well as operational decisions had to be balanced with respect to data integrity versus the very practical and unpredictable nature of undercover investigations.

Development of the Compliance Buy Outcome Report

Item - Objectives Matrix

In developing the CBOR, project staff considered the study objectives and developed a series of research questions related to each objective. To answer these questions a data collection instrument package was designed. The data collection instrument package consisted of three information sources:

- Compliance Buy Outcome Report
- Food Instrument Redemption Data

- Information for High Risk Analysis.

While investigators provided information for the CBOR, the State agencies in the sample were requested to provide the redemption data as well as certain limited information about their high risk vendor identification systems and a list of vendors whom they had classified as high risk during the period of the study. An item-objectives matrix was developed which demonstrated the relationship between each of the primary and secondary study objectives, one or more research questions, and one or more of these information sources.

Two sections of the CBOR were not referenced in the matrix. These sections contained information about the physical description of the store personnel who handled the WIC transaction and information about the donation of purchases to charitable organizations. The former section was added to the basic instrument in order to provide evidence to the States which is commonly used in administrative hearings related to vendor sanctions. The donation section was added to account for the disposition of all items purchased during the buys.

CBOR Pretest

In late August 1990, a pretest of the draft Compliance Buy Outcome Report was conducted with the assistance of the Virginia State Health Department. Three Pinkerton investigators conducted one WIC transaction in each of nine judgmentally selected stores in Northern Virginia. The purpose of the pretest was to determine the quality of data that the CBOR would yield and its usefulness for recording compliance buy findings. The pretest also provided the investigators with an opportunity to test compliance buy procedures and to report their insights into the feasibility of plans for investigator training and field operations.

An abbreviated training program was developed for the pretest. The three Pinkerton investigators were provided with an investigator handbook and handouts presenting the pretest objectives, compliance buy types, and Virginia WIC State agency food requirements. The format of the training session was an informal working session in order to encourage the investigators to ask questions and make comments.

While the pretest was not intended to test implementation of the complete study design or field data collection plan, it did produce many useful insights into not only the CBOR's design, but also the planned compliance buy methodology, investigator training, and compliance buy field operations.

Summary of Pretest Findings

The nine CBORs completed by the Pinkerton investigators following the pretest compliance buys were reviewed to assess the following aspects of instrument design:

- Item comprehension
- Difficulty experienced in answering any question
- Investigator's interest and attention to completing the Report as a whole, and each part of the report

- Item flow
- Clarity of skip pattern.

Follow-up interviews with the investigators indicated that they experienced no serious difficulty in answering any of the items. Their suggestions for clarifying instructions or format were included in the revision of the form.

The pretest buys were made based on a "generic" food package. In other words, the CBOR itself was printed with the type and quantity of each item to be purchased. Each item was shown on a separate page and several questions were asked about each item. Naturally, the CBOR thus developed would correspond only to one food package type used by Virginia. Such an approach, while fairly simple to develop for one food instrument type for one State, was not the type of approach which could work for the study as a whole. Simply put, the lead time which would have been required to develop State-tailored data collection instruments would have been enormous.

While the price collection method in the draft CBOR worked well enough in the pretest, it did not meet the need for a simple, uniform data collection instrument for the national survey. Recognizing the variety of food packages issued to participants in the States and the potential need to memorize certain aspects of the transactions, a major change in the format of the item/price questions was recommended. A single, uniform food item/purchase price grid was later designed and incorporated into the data collection methodology. Prior to the buy, the investigators would record in this grid the quantity, size, and description of each item specified on the food instrument to be used on the buy. After the buy and next to each item specified, the investigators would record what was actually purchased as well as shelf price, receipt price, item descriptor codes, and price verification codes. This format was similar to that used by State agencies to document compliance buys.

The pretest raised to prominence several technical issues which would be resolved in the following months:

- The method to be used to assign food package(s) for the buys, their type and proportion
- The method of verifying prices which would be followed during field operations
- The method for ensuring that investigators would be familiar with the unique food delivery requirements of the various States in the sample, and
- The rules investigators must follow in conducting the buys, in both routine and unusual scenarios.

Pretest Recommendations

In addition to refining the format for data collection, the pretest held implications for the compliance buy methodology, the training methodology, and for field operations.

For example, regarding the order and type of compliance buys to be made, it very quickly became clear that trained investigators wanted a degree of discretion in the field which would compromise the study's statistical requirements for consistency in the application of data collection procedures. Emphasizing the approved compliance buy protocol(s) during investigator training was essential to offset the natural inclination of a trained investigator to escalate a compliance buy scenario. The training program, it was felt, needed to differentiate clearly between the type of consistent behavior required for accurate data collection and the behavior one might follow if an undercover investigation were being conducted for other purposes. In the final investigator procedure manual, a list called "Differences Between State Agency Compliance Activity and Pinkerton Compliance Activity" was included to help clarify the data collectors' role. Ironically, the pretest also highlighted a general rule of compliance investigation which is somewhat in conflict with the need for consistent application of procedures. That is, in order to avoid compromising the covert nature of the data collection, investigators must usually do whatever the vendor instructs them to do.

The pretest also highlighted the need to develop certain types of training materials. Profiles of WIC participants were needed so that investigators could more easily identify and assume their roles as WIC shoppers. The concept of proxies (parents or other persons authorized to cash a WIC participant's vouchers) also had to be developed as it became clear that investigators might be of either gender and widely varying in age. Appropriate "roles" needed to be taught. The importance of including actual compliance buys into the training methodology was also recognized.

The pretest led to the reconsideration of proposed methods for collecting price information from the buys. At that time it was assumed that a receipt would be the primary method of verifying the price of items purchased during compliance buys in stores which used cash registers with automatic price readers. In other types of stores, it was assumed that a second investigator would return to the store or a second investigator would accompany the first investigator to collect price data. Investigators were to be told not to memorize price or use a "shopping" list to covertly record shelf process, even though one investigator had, on her own initiative, successfully used the latter method during three pretest buys. Ultimately, recognizing the variety of legitimate price collection methods an investigator could use and a number of different methods to verify those prices, the study developed a price collection strategy which was included in the training program.

The pretest raised other operational questions. It highlighted the fact that vendors sometimes do or say something other than the expected. During the pretest one vendor asked for additional identification containing the investigator's home address. Investigators had to be trained to react to vendor-initiated actions which might compromise a series of buys.

Advisory Panel Meeting

In October 1990, a meeting of the study advisory panel was held at FNS Headquarters. The meeting sought the input of recognized WIC Vendor managers from several States on the general progress of the study design, the revised data collection instrument, possible changes in the compliance buy protocol, investigator training methods, and other areas of participant expertise. Further consultation with FNS based on the outcome of the advisory panel meeting led to:

- acceptance of the modified data collection instrument (purchase grid)

- a commitment to include actual buys in the training plans

- a revision of the compliance buy protocol which limited buy types to two: "safe" buys and major substitution buys, and

- a commitment to States to provide copies of the CBORs after data collection was complete and future access to investigators if needed to testify in hearings resulting from violations documented during the study.

Food Package Assignment Strategy

In February 1991, the contractor received approval from FNS regarding the strategy to be used in selecting and assigning food packages to the buys. To obtain reliable national estimates of loss due to overcharging, food packages had to be used which reflected the relative percentages of women, infants, and children participating in WIC nationwide. Data from November 1990 indicated that participation was as follows: women -- 23 percent; infants -- 33 percent; and children -- 44 percent. Of certified women, pregnant women made up approximately 70 percent. The specific food packages requested of States were:

Women -- the most commonly issued package for a pregnant woman

Infants -- the most commonly issued package for infants over six months of age (i.e., to include formula, juice, and cereal)

Children -- the most commonly issued package for children over two years of age.

A method was developed and applied to the vendor sample such that each vendor was assigned a food package type. This was in addition to a "Vendor Group" designation which specified the number and type of compliance buys to be made at each store. The food package assignment was made without regard to store type and had to be adjusted later to take into account the problem presented by pharmacies in the sample, i.e., that only infant packages could be assigned to this store type. This adjustment was accomplished by trading of food packages inappropriate for pharmacies with those assigned to other stores in the area. In general, this trade-off was accomplished prior to the conduct of buys and was incorporated into the Vendor Roster.

The assignment of food instruments to compliance buys was further complicated by the fact that States issue varying numbers of food instruments for the three types of food packages. For example, in Texas and California from 7 to 9 individual food instruments might be issued to make up a single monthly food package for a woman or child. While most States issue 3 or 4 food instruments per month, some States issue as few as 1 or 2 per month. Thus, each State's practice had to be individually analyzed and a method devised to ensure that enough food packages of the appropriate type were ordered to complete the specified number of transactions in each store (3, 4, or 5). In States which issued individual food item instruments, a system was developed for using 2 or 3 FIs on a single transaction. In States on the low end of the issuance

spectrum, two solutions were available: extend the buys over a longer period of time or use "twin" participants to compress the time needed to make the required number of passes.

In addition, because individual food instruments have varying dollar values, a system of rotating the order in which the food instruments would be used was developed. This was intended to assure that the value of food instruments used did not bias the study results by ensuring that each food instrument had an equal chance of being used.

Although this complex food instrument assignment scheme was necessary, it was realized early on that this process must ultimately be transparent to the investigators. A relatively simple assignment process which specified for each transaction, at each vendor, the serial number(s) of each food instrument to be used on each buy was developed using the Vendor Roster (Exhibit III.1). This roster was a combination of computer-generated information about each vendor's group, food package, and food instrument usage order, and a manual assignment of food instrument serial numbers to each transaction. Thus, it was possible to provide investigators with a self-contained, individualized dossier for each vendor assigned to them, improving study control and reducing the possibility of errors in selecting FIs for each transaction.

During the period when the food package assignment strategy was being developed, information and other materials from each State in the sample was requested and received. These materials included sample FIs, approved food lists, and participant and/or vendor education materials. These materials were helpful in pinpointing unique State food delivery features, such as vendor-specific systems, number of FIs per food package, purchasing requirements for cheapest brands, all items, etc. A profile of each State was developed summarizing these features which was incorporated into the training materials later provided to the senior investigators. A profile was provided for each State where the area supervisor had responsibility.

Development of the Investigator Training Curriculum

Objectives

Because a great deal of information needed to be conveyed to a large audience whose knowledge about the WIC Program was limited, the training objectives were defined to:

- Provide background information about the study,
- Provide background information about the WIC Program,
- Provide profile information about WIC participants and proxies,
- Provide information about approved WIC foods and related ineligible items,
- Provide general information about WIC vendors and WIC food instruments,
- Provide detailed instructions on the proper completion of the CBOR and interpretation of the Vendor Roster,
- Provide instructions for price data collection and verification,

EXHIBIT III.1: SAMPLE OF COMPLETED VENDOR ROSTER

Vendor Roster A

STATE: CA
Vendor ID: 0079 CONTROL: 292559
NAME: LIBERTY MARKET-7TH STREET
ADDR: 475 7TH STREET
TURLOCK, CA 95380
ANN'L REDEMPTION: $29,988.72
GROUP: A PARTICIPANT TYPE: C
BUY SEQ: 2 (ASPEN USE ONLY)

Transaction Number	Food Instrument Serial No.	Not to Exceed Amount
Buy #1	June	
0079 - 1 1	01043224 Milk	$ 6.00
0079 - 1 2	01043224 Cereal	$ 13.00
_____ - 1 3	_____	$ _____
Buy #2		
0079 - 2 1	01043224 Milk	$ 6.00
0079 - 2 2	01043224 Juice	$ 8.00
_____ - 2 3	_____	$ _____
Buy #3		
0079 - 3 1	01043224 Eggs	$ 7.50
0079 - 3 2	01043224 Juice	$ 8.00
_____ - 3 3	_____	$ _____
Buy #4		
0079 - 4 1	01043224 Milk	$ 6.00
0079 - 4 2	01043224 Cheese	$ 10.00
_____ - 4 3	_____	$ _____
Buy #5	July	
0079 - 5 1	01043225 Milk	$ 6.00
_____ - 5 2	01043225 Cereal	$ 13.00
_____ - 5 3	_____	$ _____

EXHIBIT III.1: SAMPLE OF COMPLETED VENDOR ROSTER (Continued)

Vendor Roster B

STATE: CA
Vendor ID: 0080 CONTROL: 292572
NAME: NATIONAL MARKET-EAST AVENUE
ADDR: 1290 EAST AVENUE
TURLOCK, CA 95380
ANN'L REDEMPTION: $5,574.24
GROUP: B PARTICIPANT TYPE: W
BUY SEQ: 3 (ASPEN USE ONLY)

Transaction Number	Food Instrument Serial No.	Not to Exceed Amount
Buy #1		
0080 - 1 1	04125016 Milk	$ 6.00
0080 - 1 2	04125016 Cereal	$ 8.00
_____ - 1 3	_____	$ _____ . ___
Buy #2		
0080 - 2 1	04125016 Eggs	$ 7.50
0080 - 2 2	04125016 Juice	$ 8.00
_____ - 2 3	_____	$ _____ . ___
Buy #3		
0080 - 3 1	04125016 Milk	$ 6.00
0080 - 3 2	04125016 Cheese	$ 10.00
_____ - 3 3	_____	$ _____ . ___

EXHIBIT III.1: SAMPLE OF COMPLETED VENDOR ROSTER (Continued)

Vendor Roster C

STATE: CA
Vendor ID: 0081 CONTROL: 292578
NAME: NEW DEAL MKT-N. SANTA CRUZ
ADDR: 121 N. SANTA CRUZ AVENUE
MODESTO, CA 95353
ANN'L REDEMPTION: $50,119.08
GROUP: C PARTICIPANT TYPE: C
BUY SEQ: 1 (ASPEN USE ONLY)

Transaction Number	Food Instrument Serial No.	Not to Exceed Amount
Buy #1		
0081 - 1 1	01043228 Milk	$ 6.00
0081 - 1 2	01043228 Cheese	$ 10.00
_____ - 1 3	_____	$ _____
Buy #2		
0081 - 2 1	01043228 Milk	$ 6.00
0081 - 2 2	01043228 Cereal	$ 13.00
_____ - 2 3	_____	$ _____
Buy #3		
0081 - 3 1	01043228 Milk	$ 6.00
0081 - 3 2	01043228 Juice	$ 8.00
_____ - 3 3	_____	$ _____

Major Substitution

Buy #4		
0081 - 4 1	01043228 Eggs	$ 7.50
0081 - 4 2	01043228 Juice	$ 8.00
_____ - 4 3	_____	$ _____

- Provide instructions for Pinkerton supervisors' responsibilities (including scheduling buys, reviewing and submitting completed CBORs, and monitoring investigators' performance),

- Provide State-specific information to Pinkerton supervisors, and

- Ensure that supervisors and investigators understand their roles and responsibilities.

In addition, certain demographic information was desired about each investigator. It was decided that this information would be collected during the training sessions by incorporating it into an exercise whose main purpose was to ensure that investigators understood their potential roles as WIC participants and/or proxies (the "WHO AM I?" exercise). This information is presented in the tables at the end of this Appendix (Tables III.1 - III.6)

Finally, a post-test was devised which would help ensure that the investigators and their supervisors had gained an acceptable level of knowledge about WIC compliance buys prior to conducting buys for the study.

Training Plan

In order to reduce the cost of training and to make group size manageable, a two-tier training program was designed. A two-day session for Pinkerton senior investigators (also called area supervisors) was planned near Washington, D.C., so that FNS staff could participate easily. This session was conducted by Aspen staff for 19 senior Pinkertons. A second wave of training was then conducted by these area supervisors in their area offices for the additional investigators needed in their areas. These one-day sessions were scheduled beginning immediately after the senior training, and 11 of the 19 sessions were attended/audited by either Aspen, FNS, or Pinkerton headquarters staff members.

As noted, the first level of training was designed for Pinkerton area supervisors. A two-day session was conducted for the Norfolk/Virginia Beach, Virginia area. Because of the importance attached to the conduct of buys during the session, the cooperation and participation of Virginia WIC staff was solicited. About a month prior to the training, Aspen staff visited the area to meet with State and district WIC staff to select stores for these practice buys. Virginia staff graciously provided information about local WIC vendors and later provided the food instruments which would be used during the training session. A local charitable organization was also contacted and arrangements were made for a centralized donation of items purchased during the session. Prior to the session the Pinkerton study liaison made arrangements for a number of cars to be available for investigator use during the buys.

While the CBOR pre-test had concerned itself with a limited data collection effort in major chain stores in Northern Virginia, the Norfolk/Virginia Beach area provided an ideal setting for a full test of the revised CBOR under almost actual study conditions. The training buys were conducted using the forms (CBORs, Vendor Rosters, batch control), policies and procedures which would be in effect during the actual data collection effort. Most importantly, however, the senior investigators were confronted with the realities of making covert buys in specially

selected high-risk WIC stores as well as the less challenging larger stores. The senior investigators were in essence "set up" for some of the most challenging tests they would face during actual field operations.

Training Materials

In preparation for the training sessions, a comprehensive training package was developed. Because so much information had to be learned in a short time by persons who then had to immediately train others, some method of ensuring training consistency was needed. In addition, we wanted to use methods and materials which would encourage as much interaction as possible between trainer and trainee. The materials developed for this purpose included:

- Training Agenda
- Procedure Manual
- Training Workbook
- Training Video
- State-specific Information Packets.

The training curriculum employed a variety of media and methods to achieve its objectives and ensure that all data collectors received consistent training. The video, procedure manual and workbook exercises were integrated, interdependent, and slightly redundant. The entire training program was designed to flow from general to specific knowledge attainment and each subsequent part was designed to reinforce previously learned information. This approach was critical since the overall structure of the session was a "train the trainer" approach. The amount and complexity of information to be learned required that the trainers be provided with materials and instructions which could be easily followed in the later sessions, which mirrored their own training, and which retained as much variety and interaction as possible.

Training Agenda

With the exception of the training video, two versions of the other training materials were developed to coincide with the two distinct audiences, senior investigators (area supervisors) and all other investigators. A single version of the videotaped material was prepared, which reduced production costs and facilitated the subsequent local training sessions.

The primary difference between the written materials used for the two sessions was the omission of supervisor responsibilities from the investigator materials. The agenda also varied in that two major exercises performed by the area supervisors during that session were omitted from the investigator program. These were: 1) a team exercise in which all the participants made one or more compliance purchases, and 2) a team exercise in which the supervisors practiced scheduling buys for a large set of stores following the scheduling rules.

A brief review of the local area agenda demonstrates how the training materials and methodology were integrated during the training programs (Exhibit III.2). Each training unit

EXHIBIT III.2: LOCAL AREA TRAINING AGENDA

8:30 - 9:30	Orientation and Introduction to WIC
9:30 - 10:00	Introduction to WIC Compliance Buys
10:00 - 10:15	Break
10:15 - 12:00	Conducting Buys for the WIC Vendor Issues Study
12:00 - 12:30	Lunch
12:30 - 2:30	Compliance Buy Outcome Report (CBOR)
2:30 - 3:00	Summary of Rules and Procedures
3:00 - 3:15	Break
3:15 - 3:45	State Materials Review
3:45 - 5:00	Post-test and Wrap-up Session

included an oral presentation of the material from a chapter of the Procedure Manual. One or more video segments was used to introduce or to reinforce the unit content. One or more written exercises were performed either during the unit or at the end of a unit to further demonstrate a lesson or to allow the participants to gauge their own comprehension level. All exercises were reviewed as a group, and questions and interaction were encouraged.

To illustrate how a sample training objective was met, consider how the investigators were taught to assume the role of a WIC shopper/participant. A video segment was first presented showing a woman being certified in a typical WIC clinic, being given her vouchers, and making her first shopping trip using them. Later, the investigators (both male and female and of various ages, ethnic background, etc.) reviewed material in the procedure manual about WIC participants. WIC participant characteristics were presented, based on information taken from the "Study of WIC Participant and Program Characteristics, 1988" and from the WIC Income Verification Study, 1988." These characteristics included education levels of women on WIC, their age distribution, marital status, average WIC household size and composition, income levels, and sources of income. The racial/ethnic distribution of WIC participants was presented by geographic regions.

Later in the training unit the investigators were directed to complete their first workbook exercise, called "Who Am I?" In this exercise, the investigators provided written information about themselves such as name, gender, racial/ethnic group membership, age, height, weight, hair color, unusual physical characteristics, etc. (This exercise was used by Aspen to construct a data file about investigators.) The second part of the exercise presented three hypothetical situations

in which buys needed to be made. The situations involved different store types and food package use (W, I, or C). The investigators are asked what "identity" they would assume in order to use the food instruments in each situation.

For the senior investigators, another opportunity to make concrete the role of WIC participant/shopper came during the compliance buy exercise. This real life experience in stores unfamiliar to the investigators presented challenges and provided insights which could not have been gained by any other training method. The exercise provided the opportunity to work in small groups using the final forms and applying study rules to real situations. In a sense, the compliance buy experience completed the "Who Am I?" exercise.

Because it was not feasible to include making buys as part of the second-tier, one-day sessions for the investigators, a different approach was used. The senior investigator trainers were asked to think of the investigators' first actual buys as "practice buys." They were instructed to review the first CBORs very closely and to discuss the first buys individually with each investigator under their supervision. They were requested to accompany investigators on their first buys if this was feasible. Additionally they were required to report to Aspen project staff directly about these first buys by a certain date. If it had been necessary, investigators who did not exhibit the desired skills could still be removed at this stage.

This description of how investigators were taught to think of themselves as WIC participants illustrates the training stream which was used to deliver instruction on each of the objectives previously listed. Similar training streams could be illustrated, for example, for food instrument familiarity, approved and non-approved WIC foods, CBOR completion, or desirable investigator behavior. Each topic flowed from general to more specific and was reinforced through oral, written, visual, and/or interactive delivery methods over time.

Procedure Manual

Each investigator was provided with a copy of the WIC Vendor Issues Study Procedure Manual. The procedure manuals (senior and investigator versions) contain written descriptions of the WIC Program and the study methodology which the investigators could keep and refer to throughout the data collection period.

The Senior Investigator version of the procedure manual was composed of six chapters which are summarized here:

1. Overview and Purpose of the Study -- includes study objectives, timeline, players and roles

2. Overview of the WIC Program -- includes WIC approved foods, WIC participant characteristics, sample WIC checks and vouchers

3. Conducting Compliance Buys for the Study -- includes definition of buy types ("safe" buy and "substitution" buy protocols); WIC vendor types and background information about WIC vendors; more detailed information about approved WIC foods; a description of the correct method for a vendor to handle a WIC transaction; general rules applying to WIC purchases such as no sales tax, non-

discrimination policy, no rainchecks, and charging current shelf price or less for WIC foods; overview of the compliance buy process to be followed including preparation and post-buy activity; acceptable purchase price verification methods; types of potential vendor abuse.

4. The Compliance Buy Outcome Report -- includes interpretation and sample Vendor Assignment Roster; general rules and line by line rules for completing the CBOR and sample completed CBOR; explanation of "second investigator" role in verifying prices; what to buy on "substitution" buys.

5. Summary of Rules and Procedures -- includes "Do's and Don'ts" for investigators; definitions of major terms used in the study; twelve scenarios and approved study responses called "What to do if..." covering such issues as store closings, refusals to accept WIC vouchers, vendor initiated abuse, etc.

6. Supervisor's Role and Responsibility -- includes overview of supervisor responsibility prior to, during, and after buys; rules about selecting charitable organizations for food and other item donations; selection and training of investigators; rules to guide scheduling buys with interval restrictions; monitoring investigator performance and submission of CBORs and weekly reports.

Training Workbook - Exercises

The WIC Vendor Issues Workbook contained the training exercises used in conjunction with the procedure manual and videotape. Two versions of the workbook were produced. The senior investigator version combined the following exercises. The investigator version of the workbook omitted exercises six and ten.

1. WHO AM I? -- Purpose: build data file of investigator characteristics and reinforce WIC participant/proxy concept.

2. MOM-AND-POP QUIZ -- Description: open-book quiz designed to review the material presented in the first two chapters of the procedure manual.

3. LABEL THE FOOD INSTRUMENT -- Purpose: ensure item comprehension, i.e., what to look for on the face and back of WIC food instruments.

4. IS THIS WIC? -- Description: comparison of WIC food instruments to sample completed purchase price grids to teach proper method of completing the purchase price section of the CBOR.

5. THE MYSTERY COBR -- Description: a sample completed CBOR with numerous errors which the trainees were required to find.

6. COMPLIANCE BUY COMPETITION -- Purpose: to provide trainees with experience conducting buys under near-study conditions using study forms and rules. Description: a four hour field exercise using teams of three senior investigators to find stores, conduct buys, complete CBORs, return to base, review

CBORs, submit CBORs with both control forms, and donate food to preselected organization. Training staff reviewed work, judged best teams, and led follow-up discussion.

7. WHAT IF? -- Description: multiple choice answers to determine the correct response to written scenarios.

8. DID YOU NOTICE? -- Description: A visual exercise conducted using the final videotape segment (described below) to test participants' observation powers and to reinforce the need to be observant before, during and after making buys.

9. WHAT'S HAPPENING IN YOUR STATE? -- Purpose: exercise to direct the senior investigators' review of State-specific information (described more fully below).

10. PRACTICE SCHEDULING -- Description: Three-person team exercise using sample list of 20 vendors and limited characteristics to schedule buys. Purpose: to demonstrate the rationale for scheduling rules and ensure participants understood scheduling process.

11. POST-TEST AND CERTIFICATION OF TRAINING COMPLETED -- Purpose: to document successful completion of training program. Description: various question and answer formats covering all major aspects of the compliance buy process and rules.

At the conclusion of each training session, the "Who Am I?" exercise and the Post-test exercise were collected and returned to Aspen in order to build the investigator data file and to document training completion.

Training Video

A single version of the training videotape was produced. It contained both dramatized information and scripted presentations by the study project staff. A copy of the videotape was provided to each senior investigator for use in training investigators locally. The videotape consisted of the following segments:

1. "Using Your WIC Vouchers" -- a dramatized introduction to WIC Program and using vouchers to shop for WIC foods excerpted from a Georgia WIC participant education video.

2. "Study Purpose" -- presentation of key Chapter 1 material by Steve Gale, FNS-OAE.

3. "Training Objectives" -- presentation of key Chapter 2 materials by Howard Garrison, Aspen.

4. "Sandra's WIC Buy" -- Original dramatization of senior investigator and investigator roles in the study including prebuy activities, the conduct of buys, documentation, and reporting.

5. "Conducting Buys for the Study" -- presentation of key Chapter 3 material by Steve Frost, Pinkerton Inc., study liaison.

6. "Did You Notice?" -- dramatization of an investigator making a series of buys at a small independent WIC store. Used in conjunction with Exercise 8, an observation/memory test, and based on a video developed by the North Carolina WIC Program for FNS' 1988 National Vendor Conference mock hearing.

State Information Packets

State-specific information packets were developed for each investigator. These packets contained more detailed information about each State's WIC operation. If a senior investigator had responsibility for conducting buys in three different states, he or she would receive three different packets. Likewise, investigators received a packet(s) for each State they worked, normally just one.

The review of State-specific information occurred towards the end of the training sessions. This purposefully delayed the introduction of State anomalies until after the investigators were familiar with the generic requirements and processes. At this point, investigators were sufficiently well grounded so that they could spot unique features and differences among State food instruments. This brought into focus any special details they would need to emphasize when training their investigators and during field operations.

Aspen training staff directed the review and discussion of the following materials included in each State Agency Information Packet:

1. A State Agency profile

2. Sample food instruments for a woman's, an infant's, and a child's food package

3. State WIC participant ID cards

4. The State's current approved WIC food list

5. A copy of State-developed participant educational materials which teach participants how to use their food instruments.

Quality Control

Throughout the training and the data collection phases of the study, Pinkerton senior investigators had direct access to Aspen project staff to answer questions and help solve problems. A toll free "WIC Hotline" to the Aspen office was available during East Coast business hours. For after business hours use, the home telephone numbers of Aspen project staff were provided to the senior investigators.

In addition, the WIC Vendor Issues Study Procedure Manual provided comprehensive written instructions on data collection procedures and rules. These rules and procedures covered every behavior, process, or form which could be reasonably anticipated. For example, "Do's and Don'ts for Investigators" made explicit the type of behavior which was expected during the buys. General and line by line instructions for completing the CBOR were provided. The "What If" instruction and exercise attempted to anticipate and provide acceptable responses to common situations which would arise during the buys. Consistent investigator training using the materials provided formed the basic quality control feature of the massive data collection effort.

Further, specific instructions for supervisory review of completed CBORs was provided. CBOR review was required prior to submission to Aspen. This review had the objective of ensuring the forms were complete, logical, and internally consistent; Pinkerton staff were not requested to verify consistency between information gathered at stores on different transactions.

Investigators were instructed to make a copy of the CBOR prior to mailing or otherwise getting it to their area supervisor. This was designed to serve two purposes: 1) prevent data loss, and 2) preserve a reference for the investigator of the previous transaction at each assigned store.

Pinkerton area supervisors submitted batches of completed CBORs to Aspen using numbered batch control documents. They were requested to make another copy of each CBOR in order to: 1) provide a ready reference in case questions about the transaction arose during Aspen review and key-entry of data, and 2) prevent data being lost in the mail.

In the subsequent training sessions of investigators, Aspen and/or Pinkerton staff were present in over half of the sessions and available to assist the trainers, if needed. As a result of this, Aspen issues a memo containing additional "What If...? situations. Shortly after field operations began, Aspen training staff reviewed incoming CBORs and issued a memorandum to Pinkerton area supervisors containing a summary of common errors found on the first CBORs and suggestions to improve their review of CBORs.

Investigator Demographics

Tables III.1 through III.6 provide investigator-related information. A total of 134 investigators performed compliance buys. Of this number, 12 percent were males and 88 percent were females. Their ages ranged from 15 years to 45+ years, with the average age for females being 28 and for males 30.6. Of the total, 102 were white, 20 were black, 11 were Hispanic and 3 were Asian.

Female investigators completed 81.8 percent of the compliance buys and male investigators performed 5.2 percent. Overcharging and undercharging occurred in proportion to the characteristics of the investigators.

TABLE III.1

DISTRIBUTION OF INVESTIGATORS PERFORMING COMPLIANCE BUYS, BY GENDER AND BY AGE

Frequency Row Percentage	Gender of Investigators		
Age	Female	Male	Total
15-24	46 90.2%	5 9.8%	51 100.0%
25-29	27 84.4%	5 15.6%	32 100.0%
30-34	28 96.6%	1 3.4%	29 100.0%
35-39	8 88.9%	1 11.1%	9 100.0%
40-44	6 66.7%	3 33.3%	9 100.0%
45+	3 75.0%	1 25.0%	4 100.0%
TOTAL	118 88.1%	16 11.9%	134 100.0%

[Unknown age = 20]

TABLE III.2

DISTRIBUTION OF INVESTIGATORS PERFORMING COMPLIANCE BUYS, BY GENDER AND BY RACE

Frequency Row Percentage	Gender of Investigators		
Race	**Female**	**Male**	**Total**
White	89 87.3%	13 12.7%	102 100.0%
Black	17 85.0%	3 15.0%	20 100.0%
Hispanic	11 100.0%	0 0%	11 100.0%
Asian	3 100.0%	0 0%	3 100.0%
Other	1 100.0%	0 0%	1 100.0%
TOTAL	121 88.3%	16 11.7%	137 100.0%

[Unknown race and gender = 17)

TABLE III.3

AVERAGE AGE OF INVESTIGATORS PERFORMING COMPLIANCE BUYS, BY GENDER AND BY RACE

Frequency	Investigators	
	Number of Investigators	Average Age
Gender		
Female	118	28.0
Male	16	30.6
Race		
White	99	28.6
Black	20	28.4
Hispanic	11	25.3
Asian	3	31.3
Other	1	30.0

TABLE III.4

NUMBER OF COMPLIANCE BUYS CONDUCTED BY INVESTIGATORS, BY GENDER AND BY RACE

Frequency	All Compliance Buys	
	Number of Buys	Percent of Total Buys
Gender		
Female	2,898	81.8%
Male	184	5.2%
Unknown	461	13.0%
Race		
White	2,303	65.0%
Black	515	14.5%
Hispanic	160	4.5%
Asian	86	2.4%
Other	18	0.5%
Unknown	461	13.0%

TABLE III.5

PERCENTAGE OF COMPLIANCE BUYS RESULTING IN AN OVERCHARGE OR UNDERCHARGE, BY GENDER OF INVESTIGATOR

Percentage	All Compliance Buys	
Gender	**Overcharge**	**Undercharge**
Female	82.9%	85.3%
Male	8.4%	7.2%
Unknown	8.8%	7.5%
TOTAL	100.1%*	100.0%

*Total does not equal 100.0% due to rounding.

TABLE III.6

PERCENTAGE OF COMPLIANCE BUYS RESULTING IN AN OVERCHARGE OR UNDERCHARGE, BY RACE OF INVESTIGATOR

Percentage	All Compliance Buys	
Race	**Overcharge**	**Undercharge**
White	60.0%	50.2%
Black	23.8%	28.0%
Hispanic	6.6%	10.9%
Asian	0.9%	2.7%
Other	0%	0.7%
Unknown	8.8%	7.5%
TOTAL	100.1%*	100.0%

*Total does not equal 100.0% due to rounding.

APPENDIX IV:

TEST OF THE EFFECT OF SHORT-TERM FAMILIARITY

APPENDIX IV

TEST OF THE EFFECT OF SHORT-TERM FAMILIARITY

Data in Table IV.1 are national estimates of the incidences of overcharging and undercharging, and dollar amounts of overcharging and undercharging where separate estimates are made from the results of each compliance buy. Estimates in the top half of the table represent each of three buys at 1,169 vendors.[1] The bottom half presents estimates from a subset of vendors (i.e., Sample A, n = 382) where five buys were assigned. All five buys were completed for most of the 382 vendors in Sample A.

Table IV.2 displays the t-test for comparisons between buys. Each number in the table is the t- or z-ratio for the indicated difference--the difference between estimates from Table IV.1 divided by the estimated standard error of the difference. For example, the first t-ratio, -1.04, equals 3,359 minus 3,908, divided by the square root of the sum of squares of 331 and 408 (i.e., -544/525.4). The data indicate that for a nationally representative sample of vendors the effect of short-term familiarity was not statistically significant.

If a familiarity effect exists, then within a panel the mischarge estimates across buys should be increasing, implying that the incidence and value of mischarging increases as more buys are made. In neither subset is there any evidence of a familiarity effect (none of the t-tests for differences were significant). This does not mean that for some individual vendors familiarity does not play a role in their mischarging the Program.

Because the effect of short-term familiarity was not statistically significant, data from the first three buys were used in the analysis (see basic buys shown in Exhibit 1.3).

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[1] The total number of unweighted vendors exceeds 1,169 for the first two buys because some of the sample vendors were determined later to be ineligible and received a weight of zero. The unweighted count is less than 1,169 for the third buy because three of the vendors did not have a third buy.

TABLE IV.1

TEST OF EFFECT OF SHORT-TERM FAMILIARITY*:

Estimated Number of Vendors (and Dollar Amounts)
with Overcharges and Undercharges
with Standard Errors in Parentheses

Sample Base		Incidence		Annual Estimated Amount in Millions of Dollars	
		Overcharge (SE)	Undercharge (SE)	Overcharge (SE)	Undercharge (SE)
Full Sample (A + B + C)	Unweighted No. of Vendors	3359 (331)	2823 (406)	30.6 (6.3)	10.0 (2.3)
Buy 1	1,205	3908 (408)	2441 (322)	42.4 (17.7)	16.2 (4.9)
Buy 2	1,172	3459 (343)	2230 (317)	45.1 (9.9)	9.5 (3.3)
Buy 3	1,166**				
One-Third Sample A					
Buy 1	381	2670 (472)	2873 (715)	19.5 (7.3)	11.8 (7.6)
Buy 2	370	3946 (809)	2156 (421)	73.6 (47.3)	18.7 (9.9)
Buy 3	368	3154 (583)	2020 (469)	41.4 (14.6)	12.4 (8.4)
Buy 4	367	3100 (440)	1676 (411)	47.5 (28.0)	6.0 (2.0)
Buy 5	363	2238 (391)	1955 (429)	16.7 (5.4)	6.5 (3.5)

*National estimates based on each buy separately.

**This number is less than the total number of eligible vendors in the sample (1,169) because three of these vendors did not have a third compliance buy.

TABLE IV.2

T-TESTS FOR THE EFFECT OF SHORT-TERM FAMILIARITY

Sample Base	Incidence		Dollars	
	Overcharge	Undercharge	Overcharge	Undercharge
Full Sample (A + B + C)				
Buy 1 vs. Buy 2	-1.04	0.74	-0.63	-1.15
Buy 2 vs. Buy 3	0.84	0.47	-0.13	1.13
Buy 1 vs. Buy 3	-0.21	1.15	-1.24	0.12
One-Third Sample A				
Buy 1 vs. Buy 2	-1.36	0.86	-1.13	-0.55
Buy 2 vs. Buy 3	0.79	0.22	0.65	0.49
Buy 3 vs. Buy 4	0.07	0.55	-0.19	0.74
Buy 4 vs. Buy 5	1.46	-0.47	1.08	-0.12

APPENDIX V:

SAMPLING AND ESTIMATION PROCEDURES

Appendix V

Sampling and Estimation Procedures

This appendix describes the plan for drawing a sample of vendors from the universe of vendors, and shows the mathematics for creating national estimates of abuse. The plan follows the design through the point of selecting primary sampling units all the way to sampling vendors in sampled primary sampling units. Procedures for determining sampling variance and detailed estimation procedures are then discussed.

In the sample design, the continental United States was divided into sixty strata of roughly equal size, where WIC redemptions by vendors were the measure of size. Each stratum was comprised of one or more primary sampling units (PSUs). A PSU is a group of one or more contiguous counties in the same state. Each PSU is constructed to have at least 80 vendors in it. From each stratum, exactly one PSU was sampled, and from that PSU, on the average 20 vendors were selected to receive compliance buys. The final sample size was calculated to be 1,200 vendors.

The following sections address the sample design, frame development, the sample selection, estimation and procedures, precision of the estimates.

V.1 Sample Design

The WIC Vendor Issues study developed a national estimate of the prevalence and magnitude of abuse among WIC vendors. It covered vendors in the coterminous United States except for Indian Reservations. Counties in states which provide only home delivery of WIC foods and counties which are not participating in the WIC program were excluded. Let U be the universe of vendors in the study, from which a sample was drawn. The universe of vendors was divided into 60 strata. Each stratum was approximately the same size, where actual or estimated WIC redemptions were the measure of size. Thus, if R is the total WIC volume in U, then the size of each stratum will be approximately R/60. No stratum was to be larger than 15% over the average stratum size, nor smaller than 15% below the average stratum size.

Each stratum is comprised of one or more primary sampling units (PSUs). If a stratum has only one PSU, that PSU is called a self-representing PSU. If a stratum has more than one PSU, each PSU in the stratum has a probability of being selected as the non-self-representing PSU of the stratum. Each PSU is wholly located within a state, though a stratum may contain PSUs from more than one state. PSUs were comprised of one or more counties, though those counties were geographically contiguous and their borders reasonably compact, having as small a circumference as possible. Each PSU in a multi-PSU stratum is created to have at least eighty (80) WIC vendors in it. As will be shown below, we selected on the average twenty vendors from each PSU. In order for the competing goals of (a) the geographic area is to be reasonably contained in the sense that investigators would have minimal travel expenses, and (b) the sampled vendors would not be all from the same neighborhood, we determined that a PSU of at least 80 vendors was reasonable. Then, among the approximately 45,000 vendors in the universe (46,773 total at the time of the WIC Vendor Issues RFP less vendors in states and territories considered out of scope), about 500 PSUs were defined.

Exactly one PSU was sampled from each stratum. Thus there were sixty sampled PSUs in the survey. Within each sampled PSU, on the average twenty-four (24) vendors were sampled, for a total of about 1,440 vendors. About 15% or so dropped out because they were no longer in business or had left the WIC program. As a result, the initial sample was reduced to 1,205 vendors, a few more than the target of 1,200 vendors. (At the time compliance buys were attempted, another 36 sample vendors had to be excluded, leaving a final sample of 1,169 vendors.) With this sample design 30 states had sampled PSUs.

The sample design is a multi-stage probability sample with m strata with one sample PSU per stratum, n secondary sampling units (clusters of vendors) and q vendors per cluster (m, n, and q are to be determined). The number of strata, the number of secondary sampling units sampled per strata, and the number of vendors sampled per PSU were all jointly determined by a variance function and a cost function which generated an optimum allocation of survey resources over the various stages of the data collection procedure for a fixed precision goal. The variance function used was:

$$V_r^2 = \frac{V^2}{m\,\bar{n}\,\bar{q}}\left[\delta_1\,\bar{n}\,\bar{q} + 1 + \delta_2\,(\bar{q} - 1)\right]. \qquad \text{(V.1)}$$

The cost function used was:

$$C = C_1 m + C_2 m\,\bar{n} + C_4\,\bar{m}\,\bar{n}\,\bar{q} \qquad \text{(V.2)}$$

where

V_r^2	=	Relvariance of a survey estimate
V_r	=	Unit relevance in the universe
δ_1	=	Within PSU measure of homogeneity
δ_2	=	Within secondary unit measure of homogeneity
C	=	Total survey cost
C_1	=	Cost per selected PSU
m	=	Number of PSUs selected
C_2	=	Cost per secondary unit
$\bar{n}$	=	Average number of secondary units selected per PSU
C_4	=	Cost per sampled elementary unit (vendor) within each secondary unit
$\bar{q}$	=	Average number of elementary units selected per secondary unit.

By assuming reasonable values for V^2, δ_1, δ_2, C_1, C_2, and C_4, based on prior studies of vendor abuse and data collection costs, it was determined that:

(a) one vendor should be sampled per secondary sampling unit ($\bar{q} = 1$ approximately)
(b) approximately 50 - 60 PSUs should be sampled, and
(c) approximately 20 - 30 vendors should be selected from each PSU.

With this design, it was assumed that the desired confidence intervals in the national estimates would be achieved at a minimum cost with a sample size of 1,205 vendors in 60 sample PSUs.

V.2 Frame Development

V.2.1 Creating Primary Sampling Units

Primary sampling units were created by grouping counties together such that each PSU was wholly contained within a state, each PSU had approximately eighty (80) vendors if in a multi-PSU stratum or may have had more if self-representing, only self-representing PSUs at the start of the creation process had more than 88 vendors, and the counties comprising the PSUs were reasonably contiguous and compact.

In order to create and stratify PSUs, the total redemptions in each county in each state were estimated. If a state furnished current redemption data, that information was used. If a state did not furnish any data on individual vendor redemption, we used the method described below.

Every county in the continental United States which operated a retail WIC vendor program was included in a primary sampling unit. Using actual or estimated data, we created useful estimates where we did have access to a list of vendors and dollars of redemptions in a state. Where such a list existed, it provided an ideal sampling frame. Otherwise, the most detailed information available was from the FNS-191 file which has the number of WIC participants in local agencies. A study of the FNS-191 file has revealed that the 1,720 local agencies are located in only about 1,300 of 3,080 counties in the United States. Thus, more than half of the counties have no local agencies although they may very well have local clinics. Consequently we had no information on the WIC participation in those counties. Our solution to this problem was to assign counties with no local agencies to nearby counties with local agencies in the PSU generation process.

To estimate, when needed, the number of vendors and/or dollar amount of redemptions in each county which has local agencies, we used information from the FNS-191 file containing the numbers of women, infants and children served by each local agency; the PC-88 study containing data on the average food package cost per participant type in each state, and the WIC Vendor Issues RFP containing total redemptions and total number of vendors in each state. None of these data sources allowed us to distinguish between vendor type, e.g., large chains versus independents versus pharmacies, etc. If there were some differences in the distribution of vendor type from county to county within a given state, we would not have been able to identify them.

Specifically, we assumed that within a given state, the ratio of vendors to FI dollars redeemed is constant. This allowed us to distribute vendors among counties with local agencies in the same ratios as estimated dollars redeemed. We estimated the number of vendors based on the WIC redemptions statewide, the average food package cost per participant type statewide, and the distribution of particpant types in each county.

First we estimated R'_{ikj}, the estimated annual redemptions in each local agency i in county k in State j. Each agency has a unique distribution of participant types (women, infant and children), where each participant type gets a food package worth a different average value. Thus,

in order to estimate the total value of food instruments issued in each agency, we needed to account for the participant distribution in the agency. We did this by creating estimates to divide the State's total redemptions among the agencies, taking into account the value of food packages for participant types and the distribution of participant types in each agency. The details of this calculation are as follows:

Let i represent a local WIC agency, k a county, and j a state.

From the FNS-191 we define the variables:

CW_{ikj} = number of women participants in agency i in county k in State j
= FNS-191 women.

CI_{ikj} = number of infant participants in agency i in county k in State j
= FNS-191 infants.

CC_{ikj} = number of children participants in agency i in county k in State j
= FNS-191 children.

From the PC88 file, we defined the average dollar amount of food packages issued for each State and class of participant as:

DW_j = average dollar value of FI package for women in State j.

DI_j = average dollar value of FI package for infants in State j.

DC_j = average dollar value of FI package for children in State j.

For some States, there were no data in the PC88 file. In those cases, we used the PC88 regional averages for the region in which the State is located. These regional averages are in the PC88 file.

The PC88 average dollar value of food packages issued was used as a proxy estimate of FI dollars redeemed by each participant type. To the extent this is inacccurate, it was corrected by a ratio estimate so that the estimated redemptions in each county sum to the State-wide level of redemptions.

We created a preliminary estimator, R'_{ikj}, for the redemptions in each local agency as:

$$R'_{ikj} = (CW_{ikj}\ DW_j) + (CI_{ikj}\ DI_j) + (CC_{ikj}\ DC_j). \quad \text{(V.3)}$$

The first term of this equation, $CW_{ikj}\ DW_j$, is the number of the State's women participants which are affiliated with agency i multiplied by the average woman's food package value. The remaining two terms are similar, but for infants and children. Let R_j' be the estimated redemptions for the whole state based on the preliminary estimates of redemption values, above.

Then

$$R_j' = \sum_k \sum_i R_{ikj}' \qquad \text{(V.4)}$$

The estimate R_j' did not equal exactly the sum of all redemptions in the state, R_j, a figure given in Table A of the WIC RFP. This is because (a) the units of time used in DW_j, DI_j, and DC_j appear to be monthly, unlike R_j, which is annual, and (b) we do not know if the data sources for the estimates are identical. To adjust for these problems and to make an annual estimate, we generated a second estimator, R_{ikj}'', of annual vendor redemptions at each local agency. We used R_j, an independent figure of redemptions at the State level from Table A of the WIC RFP, to generate a ratio estimator, R_{ikj}'', of the redemptions in each agency i:

$$R_{ikj}'' = \frac{R_{ikj}'}{R_j'} R_j \qquad \text{(V.5)}$$

Where we had lists of vendors for each county, we associated the estimate R_{ijk}'' in determining an estimated measure of size for the PSU. Where there were no state lists of vendors available, the estimated number of vendors, V_{ikj}'', associated with each local agency was derived from V_j, the number of vendors in State j, R_{ijk}'', and R_j, the total redemptions in State j. The data source for this was the WIC Vendor Issues RFP, because it was the most current available.

$$V_{ikj}' = \frac{R_{ikj}''}{R_j} V_j \qquad \text{(V.6)}$$

As explained above, this ratio estimate assumes that the total numbers of vendors in States are allocated to the local agencies in proportion to each local agency's estimated redemptions.

Thus far, we have described how estimates were computed of the number of vendors, V_{ikj}', and dollars redeemed, R_{ikj}'', associated with each local agency i. For states which could not provide us with a vendor list, these estimates were used.

A two-step PSU creation process aggregated counties into PSUs. In the first step, self-representing (SR) PSUs were created using Metropolitan Statistical Areas (MSAs) to guide the grouping of counties into self-representing PSUs. In the second step, the remaining metropolitan and non-metropolitan counties were divided into PSUs with either metropolitan or non-metropolitan characteristics and with at least 80 vendors in each PSU. In both steps, the same state, size, contiguity and compactness criteria mentioned earlier were maintained.

Primary sampling units, were created from metropolitan counties using the grouping of counties according to standard OMB definitions of each Metropolitan Statistical Area. All county groups which were in the same MSA were considered as a single PSU. Census county code identifying each county as primarily metropolitan or non-metropolitan and the Area Resource File

(ARF) association of counties to MSAs were used. The ARF classifications are based on the Federal Information processing system standards.

The procedure used to identify self-representing PSUs was to rank the MSAs by size, R_{MSA}. Starting with the largest MSA, the procedure was to go down the list of MSAs, summing the redemptions from each MSA. Let H be the set of self-representing PSUs. Stop going down the list when h, the number of MSAs in H, is calculated to approximate:

$$\sum_{PSUs\ in\ H} R_{PSU} = \frac{h\ R}{60}. \qquad \text{(V.7)}$$

That is, stop adding PSUs to the self-representing (SR) set, H, when the average size (i.e., average redemption total) for the SR PSUs equals the average stratum size, R/60. Some of the SR PSUs calculated had redemptions greater than the average stratum size, R/60, and some had fewer redemptions. As a group, however, the SR PSUs had an average size of R/60.

V.2.2 Creating and Stratifying Non-SR PSUs

We have already discussed the creation of self-representing primary sampling units. They are self-representing (SR) in the sense that each SR PSU is a stratum unto itself. There are h such strata, leaving g = 60 - h strata to be filled with non-SR PSUs. Each non-SR PSU is comprised of single counties or county groups which are either metropolitan, non-metropolitan, or, in a few cases, mixed; and are subject to same-state, contiguity and compactness criteria. Each PSU was created to have on average 80 vendors.

The non-SR PSUs are stratified by FNS region (seven region) by type of food instrument (check or draft versus voucher), and by metropolitan versus non-metropolitan counties. Each stratum has an aggregate measure of size of approximately R/60. When non-SR PSUs are grouped into the g strata, each stratum may contain PSUs in different states in the same FNS region. At this point in the design, then, we were ready to draw the sample of PSUs.

V.3 Sample Selection

V.3.1 Sampling of Primary Sampling Units Within Strata

Some of the strata were comprised of self-representing primary sampling units. These SR PSUs were selected with certainty. What remained was the selection of non-SR PSUs from the Region and Metro/non- Metro strata. A PSU within each stratum with probability proportion to size (PPS) taking into account the desire for a substantial amount of agreement between the actual number of selected sample PSUs by state, and the expected number was selected. In each stratum in a set of strata, PSUs were ordered by size within the state and the order of states was the same from stratum to stratum. The relative probability of each state (and PSU within state) was displayed and successive cumulants were determined. The strata in a set are randomly ordered. A systematic sample of selection values is determined, with the number of selections equal to the number of strata. These selection values are associated, in order, with the randomly ordered strata and identify the selected sample PSU in each stratum.

The probability, P(t), of selecting a given PSU t is:

$$P(t) = 1 \qquad \textit{if the PSU is self-representing,}$$

$$P(t) = \frac{\textit{size of PSU}}{\textit{size of straum}} \qquad \textit{if the PSU is non-self-representing.}$$

V.3.2 Vendor Sampling Within Each Primary Sampling Unit

Two within PSU sampling ratios were used so that on the average twenty vendors, after accounting for an expected sample loss of 15%, were sampled from each primary sampling unit in the sample, with an oversampling of other than large chain stores relative to large chain stores. Vendors on Indian Reservations were excluded. The logic and mathematics for this approach is presented in this section.

Analysis of violation-prone vendors in the Food Stamp program, which is similar to WIC, shows that vendor abuses are less frequent at large chain stores (LCS) than at other than large chain stores (OTLCS). Thus the LCSs were expected to account for a small part of the dollars lost in the program. Since primary interest was in getting the most precise estimate of the total dollars lost for the available budget, attention was focused on the OTLCSs. This was accomplished by oversampling the OTLCSs relative to the LCSs. A rule of thumb among sampling statisticians is that without additional information, sampling weights should not vary by more than 3:1. This was achieved in the following way:

Let y be the number of LCSs selected
z be the number of OTLCSs selected
x be an oversampling rate to account for loss due to the expected turnover of vendors between the time the sample is drawn and the study is fielded, and a loss of vendors because of compliance buy errors

Then the following equation states that the total sample is 1200 plus a loss rate:

$y + z = 1200\ (1 + x)$.
Let w be the sample weight of OTLCSs,
then 3w is the weight for LCSs.

The next equation states that the ratio of weighted sample of LCSs to the national total of LCSs, V_{LCS}, is equal to the ratio of the weighted sample of OTLCSs to the national total of OTLCSs, V_{OTLCS}:

$$\frac{y\ (3\ w)}{V_{LCS}} = \frac{Z\ w}{V_{OTLCS}} \qquad \textbf{(V.8)}$$

This forces the desired sampling ratio $y{:}z = V_{LCS}{:}3V_{OTLCS}$. Combining the two equations, we can solve for y and z to be:

$$y = \frac{1200\ (1+x)\ V_{LCS}}{3\ V_{OTLCS} + V_{LCS}}$$

and

$$z = \frac{1200\ (1+x)\ (3\ V_{LCS})}{3\ V_{OTLCS} + V_{LCS}}. \qquad \textbf{(V.9)}$$

The counts of LCSs and OTLCSs specific to the conditional set of selected sample PSUs were used in order to get the exact sample size for y and z. V_{LCS} and V_{OTLCS}, the national estimates of large and other than large chain stores based on the conditional set of PSUs in the sample were used. The estimates were made, starting with the lists of vendors provided by each state with PSUs in the sample. An exact count of LCSs, and OTLCSs, V_{OLTStg}, denoted V_{LCStg} and $V_{OTLCStg}$,in each sampled PSU t in stratum g was obtained from some of the States or generated from State data. The exact distinction between OTLCSs and LCSs was not critical at this stage of the sampling. Any misclassifications that were identified did not create a problem for sampling purposes. Statistically each vendor retained the sampling weight of the original list it was drawn from. Using these lists, the number of LCSs and NLCSs in each stratum was estimated:

For LCSs in stratum g, where g=1 ... 60 (both SR and NSR)

$$V_{LCS_g} = V_{LCS_{tg}} \frac{R_g''}{R_{tg}''}$$

and for OTLCSs in stratum g

$$V_{OTLCS_g} = V_{OTLCS_{tg}} \frac{R_g''}{R_{tg}''}. \qquad \textbf{(V.10)}$$

The next task is to make national estimates from these counts. Define the estimate of the number of LCSs nationally as:

$$V_{LCS} = \sum_{g=1}^{60} V_{LCS_g}$$

and the number of OTLCSs nationally as

$$V_{OTLCS} = \sum_{g=1}^{60} V_{OTLCS_g}. \qquad \textbf{(V.11)}$$

We can now estimate y and z and can therefore calculate the sampling weight for OTLCSs, w, as

$$w = \frac{V_{OTLCS}}{z}$$

and the sampling weight for LCSs, 3w, as

$$3w = \frac{V_{LCS}}{y}. \qquad \textbf{(V.12)}$$

Now, the within sampling rate for each of the self-representing PSUs will be

$\frac{1}{w}$ for the OTLCS list

and $\frac{1}{3w}$ for the LCS list.

For each non-self representing PSU t, the within sampling rate will be

$\frac{1}{w}\frac{R_g}{R_{tg}}$ for the OTLCS lists in the gth stratum

and $\frac{1}{3w}\frac{R_g}{R_{tg}}$ for the LCS lists in the gth stratum.

These within-sampling rates (with random starts) together with the lists for each sample PSU were used to determine the list of sample vendors. For the LCSs, the within PSU sampling interval was used after a random start to provide a systematic probability sample from an ordered list of LCS vendors (ordered by amount of redemption). For the OTLCSs, the vendors in each sample PSU also were ordered by amount of redemption. The within PSU sampling interval was used after a random start to provide a systematic probability sample from the list of ordered vendors. This provided a proportionate sample of vendors by WIC redemption amount. The advantage of systematic sampling lies in avoiding the variation in effective sampling rates in strata with small numbers of units (in proportionate stratified sampling of vendors by redemption class intervals) and therefore reduces the "tail-end" variance effect of such variation in effective rates.

V.4 Calculation of Initial Sampling and "Nonresponse" Weights

Each vendor in the sample started with a basic sampling weight which was the reciprocal of the probability of selection. Specifically, the basic sampling weight, W_{ij}, assigned to sample vendor j selected from PSU i was computed as follows:

$$w_{ij} = 1/P(V_{ij}) \qquad \textbf{(V.13)}$$

where $P(V_{ij})$ equals the probability of selection of sample vendor j selected from PSU i.

The sampling weights of vendors varied somewhat by PSU and type of vendor (LCS or OTLCS):

Large Chain Stores (LCS)

PSU 51	59.33
PSU 53	29.32
Other	58.65

Other Than Large Chain Stores (OTLCS)

PSU 01	9.78	PSU 39	20.83	PSU 54	24.21
PSU 19	44.66	PSU 40	26.57	PSU 56	25.23
PSU 21	10.88	PSU 41	27.52	PSU 60	24.31
PSU 23	20.56	PSU 51	59.33	Other	19.55
PSU 27	30.89	PSU 53	28.43		

Some sample vendors were found to be out-of-scope (closed, no longer in WIC program, etc.) and are not in the study.

Some in-scope sample vendors had an incomplete number of buys (relative to the original number for the group -- A (5), B (3), C (3 usual buys)). For the incomplete buys an objective procedure was used to assign an imputed pair of data (whether the buy represents an abuse or an undercharge transaction, and, what percentage of the value of the food instruments used for the buy was an overcharge or undercharge). The procedure selected one vendor, at random, with a complete set of buys from the vendors in the same PSU, vendor type, and client type assignment (W, C, or I) and used the completed buy values for the vendor with incomplete buys -- a "hot deck" procedure used by the Census Bureau and many other statistical agencies for dealing with "item nonresponse." This procedure was used since it made fewer assumptions than the alternative of using the values of the last completed buy for all other buys of the vendor with an incomplete set of buys.

Some in-scope sample vendors had no buys. These were in some cases because of a legal hearing, investigator error, duplicates of others in sample, and other reasons. For any in-scope sample vendor who had no buys a "nonresponse" adjustment was used by multiplying the basic weight for a set of vendors in a given PSU set (defined by Group A, B, C, and type of food package W, C, I)) by the factor:

$$f_{ik} = \frac{\text{No. of In-scope Vendors of a given Vendor Type (LCS or OTLCS), for } k^{th} \text{ set}}{\text{No. of Vendors of the Same Type for } k^{th} \text{ set with Completed Buy Sequences}}$$

In the event that any factor f_{ik} exceeded 2, the excess was assigned first to an equivalent set (B or C) or within the same set to another food package (W or C), etc. The product of w_{ij} and f_{ik} provided an adjusted weight w_{ij} which is the weight specific to the j^{th} in-scope vendor in the i^{th} PSU:

$$w'_{ij} = w_{ij} f_{jk}. \qquad \textbf{(V.14)}$$

These are the weights subsequently used for incidence estimates.

V.5 Estimation Procedures

V.5.1 Basic Estimates

We now discuss in general how national estimates of incidence and dollar loss were derived from the sample of safe buys. Incidence estimates are simpler than estimates of dollar loss. If the abuse in question occurred at any time during any of the visits to the vendor, that vendor was defined as abusive.
Let

$$B_{ua} = \begin{cases} 1 \text{ if vendor } u \text{ committed abuse } a, \\ 0 \text{ if vendor } u \text{ did not commit abuse } a. \end{cases}$$

Then the number of vendors, V_a, who would commit abuse a on at least one of the three buys was estimated as:

$$V'_a = \sum_u B_{ua} w_u \qquad \textbf{(V.15)}$$

where w_u equals the sampling weight for sample vendor u, as defined in the previous section on basic sampling weights.

This sum will weight only those vendors who actually committed the abuse even though the sum and is over all vendors.

To estimate the incidence of abuse in a subset S of the universe U, simply perform the summation over the subsample that falls in S.

In aggregating the abuses detected up to a national estimate of dollar loss, we took the average abuse rate of dollars of abuse detected by the sample buys as an estimate representative of the average rate of abuse in all the dollars of retail redemptions in the store. The estimated abuse rate, I'_u, was computed as:

$$I'_u = \bar{A}_u / \bar{R}_u, \qquad \textbf{(V.16)}$$

where $\bar{R}_u$ the average shelf price of the first three compliance buy transactions at vendor u, and $\bar{A}_u$ was the average dollars of abuse in the first three compliance buy transactions at vendor u. When there was an undercharge in a compliance buy, this entered as a zero in the total dollars of abuse entering into the calculation of $\bar{A}$.

The quantities comprising this estimate were collected in the field or calculated after the food instruments were redeemed. The dollar difference due to overcharging was the difference between the sum of the item shelf prices and the redemption value as entered by the vendor on the FIs comprising the transaction. The initial national estimate of dollar loss for the survey period was then:

$$A' = \sum_u R_u \, I_u' \, w_u, \qquad \textbf{(V.17)}$$

which is the sum over all vendors of each sample vendor's redemptions during the survey period, R_u, multiplied by the vendor's abuse rate and sampling weight.

Estimates of dollar loss for various subsets of vendors were also calculated using Equation V.17, only that the sum was over all vendors in the subset of interest, S, rather than the universe, U, of vendors.

For initial estimates of <u>undercharge</u> amounts, equations V.16 and V.17 were used with $\bar{A}_u$ in Equation V.16 computed as an average <u>undercharge</u> rate across the three buys. In this case, overcharges were entered as zeros in computing the average undercharge rate across the three buys.

For computing the overcharge and undercharge estimates based on single buys (Table IV.1 in Appendix IV), the average overcharge, undercharge, and redemption values used in Equation V.16 are simply the single values associated with each compliance buy.

V.5.2 <u>Ratio Estimation</u>

Ratio estimation was used to improve the precision of results for estimates of dollar amounts (and derived data). The improvement in precision was relative to the precision using the sets of weights described above. This approach is common in estimation from probability samples when auxiliary information, with useful correlation with the quantity being estimated, is available (Cochran, 1963; Hansen, et.al., 1953; Kish, 1965). The auxiliary data (amount of redemption by vendor) available from the data collected in devising the frame used for sampling in 1990 as well as the data currently collected on the amount of retail redemptions in the survey month of July 1991 (or as close to July as possible) for each sample vendor were used. In addition, the actual dollar amount of retail redemptions for the same period had been collected (compiled from data supplied by each of the 47 States that operate retail purchase systems for WIC food delivery).

The two step ratio estimation procedure was carried out as follows:

(a) The retail redemption data used in devising the frame, separately by LCS and OTLCS was arrayed in ascending redemption value and successive cumulants of the values were derived (with appropriate imputation, systematically, for the vendors with missing values). The redemption value at each quartile[1] was established. The aggregate retail redemption value in each of the four subsets within LCS and OTLCS was designated as ${}_{90}R_{hT}$, where h = 1, 2, 3, 4 and T = LCS or OTLCS. A similar array was created using the sample cases with weights determined by the method described in the earlier section on estimation procedures. The values at each quartile of the universe frame were used as boundary values for the weighted sample distribution so that the post-stratification values of boundaries of the strata for the frame and the sample were the same.

The values of ${}_{90}R_{hTij}$ (for the j^{th} vendor in the i^{th} PSU) when weighted by w_{ij}' provided an estimate of ${}_{90}R'_{hTij}$ for each sample vendor. The values were summed for all vendors in each h, T combination so that:

$$ {}_{90}R'_{hT} = \sum_i \sum_j {}_{90}R'_{hTij}. \qquad \textbf{(V.18)} $$

The factor $f_1 = {}_{90}R_{hT}/{}_{90}R'_{hT}$ was used to multiply the weights w'_{ij} so that:

$$ w''_{ij} = f_1 w_{ij}. \qquad \textbf{(V.19)} $$

(b) The redemption data for July 1991 (or a near-by month) for the sample vendors were then weighted by w''_{ij} and summed to provide the estimate:

$$ {}_{91}R' = \sum_i \sum_j {}_{91}R_{ij} w''_{ij}. \qquad \textbf{(V.20)} $$

The redemption data for the 47 states,

$$ {}_{91}R = \sum_s^{47} {}_{91}R_s, $$

and ${}_{91}R'$ then provided the value of the second factor:

$$ f_2 = {}_{91}R/{}_{91}R'. \qquad \textbf{(V.21)} $$

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[1] Terciles were considered for the LCS universe if the actual number of cases in the highest quartile of the distribution of sample cases were less than 10.

The final weight (for estimates of dollar loss) for the j^{th} sample vendor in the i^{th} PSU was then:

$$w_{ij}''' = f_2 w_{ij}''. \qquad \text{(V.22)}$$

Once the final weights were derived from Equation V.22, the final estimates of overcharge accounts, A'', were computed using Equation V.17, with final weights substituted for initial weights:

$$A'' = \sum_u R_u I_u' w_u''' \qquad \text{(V.23)}$$

where R_u and I_u' are as defined for Equation V.17, and w_u''' is the final weight assigned to sample vendor u, computed from Equation V.22.

V.5.3 Approximate Precision of the Estimates

In Exhibit V.1 the speculated level of precision for various levels of national estimates is given both for the estimated percent of vendors that have abuse or fraud as well as the estimated dollar amount of vendor abuse. In general, these speculated estimates of sampling variability were intended to give an order of approximation for various levels of percents of vendors and for various estimates of vendor abuse for varying characteristics of vendor abusers. To the extent that a particular type of vendor is in a substratum that has been undersampled (large chains), a factor of perhaps one and one half times the estimated sampling error shown on the table was more likely to occur than the ones shown. On the other hand, for high risk vendors, the likelihood was that the sampling errors would be somewhat smaller than those shown.

V.6 Variance Estimation

The WIC Vendor Issues Study had a survey design involving multi-stage sample selection. In addition, ratio estimates were used for many analytic results. In order to deal with these design elements as well as to provide an effective means for estimating the variances for estimates of various study parameters, the method of Balanced Half-sample replication was utilized (McCarthy, 1966).

The overall sample was partitioned into many overlapping subsamples (each subsample being about half the total sample) to produce a number of replicated estimates of any specific statistic. The precision of the sample statistic was then estimated from the variance among the replicated estimates by the following formula:

EXHIBIT V.1: SPECULATED SAMPLING VARIABILITY ASSOCIATED WITH VARIOUS NATIONAL LEVELS OF DETECTED ABUSE AND DOLLAR ERROR

FOR A SAMPLE SIZE OF 1,200 VENDORS

Percent of Vendors Detected to be Abusive	Sampling Error (95 Percent Chance)
2	.8
3	1.0
5	1.2
7.5	1.5
10	1.7
15	2.0
20	2.3
30	2.6
50	2.8

Vendor Abuse in Millions of Dollars	Sampling Error Millions of Dollars (95 Percent Chance)
5	1.5
10	2.1
15	2.6
20	3.0
25	3.4
35	4.0
50	4.8
75	5.8
100	6.7
180*	9.0

* Speculated Total Abuse
Source: Survey Design, Inc., August 27, 1989 and January 29, 1990

$$s_{v}^{2} = \frac{1}{n} \sum_{i} (V_i - V)^2 \qquad \text{(V.24)}$$

where

n = the number of replicates,

V ' = the estimate of V based on the entire sample, where V is a vendor characteristic like total number who overcharge or total amount overcharged,

V_i' = the estimate of V based on the i^{th} subsample (replicate).

The variance of a number of different types of statistics was estimated using this method including totals and percents.

The replicates were constructed by (1) splitting each SR PSU into two half-samples and (2) grouping the remaining PSUs into pairs that were relatively homogeneous. Since the number of PSUs to be paired was an odd number, the pairs were established in a conservative manner by using one of the SR PSUs as a member of a pair. Thus, 16 half-sample pairs were defined by splitting each of 16 SR PSUs, and 22 more half-sample pairs were defined by pairing the remaining 44 PSUs. Exhibit V.2 displays the procedure used for carrying out this task. Each half-sample was coded either + or -.

One of the two members of each of the 38 sets of pairs was then included in each replicate (half-sample) in such a way that each member was included in half of the half-sample replicates. To determine which subset of each set was selected in a given replicate, the method described by Plackett and Burman (1943-46) was used. The method has the useful property that there is "cross-product balance" which follows from the fact that the columns in the matrix used are orthogonal to one another. Exhibit V.3 provides a set of balanced half samples for the overall set of 16 self-representing PSUs and the 22 pairs of PSUs devised from the remaining 44 PSUs.

The half-sample member of a pair that belongs to a given half-sample replicate is identtified by the + or - sign that refers to that pair for the replicate. The designated signs for each replicate are given in Exhibit V.2.

The number of half samples used was a function of the fact that a total of 38 sets are defined for this study. There was no analytic subgrouping that appeared appropriate to be used. Therefore, as discussed in Gurney and Jewett (1975), the smallest value of n was used so that the expression:

$$(p^n - 1)/(p - 1) \geq 38$$

is equal to or greater than 38, where p is the number of subsets of each set. Since p = 2, and n needs to be an integer, n = 6 satisfied the inequality. Thus, 64 was determined to be the needed number of replicates.

EXHIBIT V.2: PROCEDURE FOR ALLOCATION OF SAMPLE VENDORS TO HALF-SAMPLES

I. Designated 16 Self-representing PSUs (PSUs 01-15, 17):

For each PSU, separately for LCS and OTLCS vendors, for each of Groups A, B, C, and separately for each type of food package W, C, I, and if more than one vendor, ranked as indicated by 1990 frame amount of redemptions, the vendors (j) are ordered as follows:

Within a given PSU:

LCS

Group A
W: largest to smallest 90 R_{ij}
C: largest to smallest 90 R_{ij}
I: largest to smallest 90 R_{ij}

Group B
I: smallest to smallest 90 R_{ij}
C: smallest to smallest 90 R_{ij}
W: smallest to smallest 90 R_{ij}

Group C
W: largest to smallest 90 R_{ij}
C: largest to smallest 90 R_{ij}
I: largest to smallest 90 R_{ij}

OTLCS

Group C
I: s to 1; C; s to 1; W: s to 1
Group B
W: 1 to s; C: 1 to s; I: 1 to s
Group A
I: s to 1; C: s to 1; W: s to 1

Number the vendors in the order established above.

In the following 8 PSUs: 1, 3, 5, 7, 9, 11, 13, and 15
The odd numbered vendors are coded +
The even numbered vendors are coded -

In the following 8 PSUs: 2, 4, 6, 8 10, 12, 14, and 17
The odd numbered vendors are coded -
The even numbered vendors are coded +

Thus, in each PSU that is in the set described in this section, a half-sample comprises the vendors coded +, and the other half-sample comprises the vendors coded-.

The PSU number (1...15, 17) defines the column to be used in Chart 2.

II. Remaining PSUs

The 44 PSU in this set are paired as shown below and one of the PSUs in each pair is coded + and the other one is coded -. All vendors in a given PSU in this set are coded identically and comprise the half-sample of the pair of PSUs. The pairs are numbered from 1 to 22 and the pair designation defines the column to be used in Exhibit V.3.

Pair Number	PSU coded +	PSU coded -
1	18	20
2	21	19
3	16	22
4	39	23
5	24	25
6	44	26
7	27	28
8	30	29
9	31	32
10	34	33
11	35	36
12	38	37
13	40	41
14	43	42
15	45	47
16	49	48
17	46	54
18	51	50
19	52	53

EXHIBIT V.2: PROCEDURE FOR ALLOCATION OF SAMPLE VENDORS TO HALF-SAMPLES (Continued)

Pair Number	PSU coded +	PSU coded -
20	56	55
21	57	58
22	60	59

EXHIBIT V.3: SET OF BALANCED HALF SAMPLES FOR 16 SELF-REPRESENTING PSUS AND 23 PAIRS OF PSUS

Half Sample	Self Representing PSU Number																Pair Number for Paired PSUs																					
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	17	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
1	+	−	−	−	+	+	−	−	−	+	+	−	+	−	+	+	+	+	+	+	−	+	−	+	−	−	−	+	+	−	−	−	+	−	+	−	+	−
2	−	+	−	−	−	+	+	−	−	−	+	+	−	+	−	+	+	+	+	+	+	−	+	−	+	−	−	−	+	+	−	−	−	+	−	+	−	+
3	−	−	+	−	−	−	+	+	−	−	−	+	+	−	+	−	+	+	+	+	+	+	−	+	−	+	−	−	−	+	+	−	−	−	+	−	+	−
4	−	−	−	+	−	−	−	+	+	−	−	−	+	+	−	+	−	+	+	+	+	+	+	−	+	−	+	−	−	−	+	+	−	−	−	+	−	+
5	−	−	−	−	+	−	−	−	+	+	−	−	−	+	+	−	+	−	+	+	+	+	+	+	−	+	−	+	−	−	−	+	+	−	−	−	+	−
6	+	−	−	−	−	+	−	−	−	+	+	−	−	−	+	+	−	+	−	+	+	+	+	+	+	−	+	−	+	−	−	−	+	+	−	−	−	+
7	+	+	−	−	−	−	+	−	−	−	+	+	−	−	−	+	+	−	+	−	+	+	+	+	+	+	−	+	−	+	−	−	−	+	+	−	−	−
8	+	+	+	−	−	−	−	+	−	−	−	+	+	−	−	−	+	+	−	+	−	+	+	+	+	+	+	−	+	−	+	−	−	−	+	+	−	−
9	+	+	+	+	−	−	−	−	+	−	−	−	+	+	−	−	−	+	+	−	+	−	+	+	+	+	+	+	−	+	−	+	−	−	−	+	+	−
10	−	+	+	+	+	−	−	−	−	+	−	−	−	+	+	−	−	−	+	+	−	+	−	+	+	+	+	+	+	−	+	−	+	−	−	−	+	+
11	−	−	+	+	+	+	−	−	−	−	+	−	−	−	+	+	−	−	−	+	+	−	+	−	+	+	+	+	+	+	−	+	−	+	−	−	−	+
12	+	−	−	+	+	+	+	−	−	−	−	+	−	−	−	+	+	−	−	−	+	+	−	+	−	+	+	+	+	+	+	−	+	−	+	−	−	−
13	−	+	−	−	+	+	+	+	−	−	−	−	+	−	−	−	+	+	−	−	−	+	+	−	+	−	+	+	+	+	+	+	−	+	−	+	−	−
14	+	−	+	−	−	+	+	+	+	−	−	−	−	+	−	−	−	+	+	−	−	−	+	+	−	+	−	+	+	+	+	+	+	−	+	−	+	−
15	+	+	−	+	−	−	+	+	+	+	−	−	−	−	+	−	−	−	+	+	−	−	−	+	+	−	+	−	+	+	+	+	+	+	−	+	−	+
16	−	+	+	−	+	−	−	+	+	+	+	−	−	−	−	+	−	−	−	+	+	−	−	−	+	+	−	+	−	+	+	+	+	+	+	−	+	−
17	−	−	+	+	−	+	−	−	+	+	+	+	−	−	−	−	+	−	−	−	+	+	−	−	−	+	+	−	+	−	+	+	+	+	+	+	−	+
18	+	−	−	+	+	−	+	−	−	+	+	+	+	−	−	−	−	+	−	−	−	+	+	−	−	−	+	+	−	+	−	+	+	+	+	+	+	−
19	−	+	−	−	+	+	−	+	−	−	+	+	+	+	−	−	−	−	+	−	−	−	+	+	−	−	−	+	+	−	+	−	+	+	+	+	+	+
20	+	−	+	−	−	+	+	−	+	−	−	+	+	+	+	−	−	−	−	+	−	−	−	+	+	−	−	−	+	+	−	+	−	+	+	+	+	+
21	+	+	−	+	−	−	+	+	−	+	−	−	+	+	+	+	−	−	−	−	+	−	−	−	+	+	−	−	−	+	+	−	+	−	+	+	+	+
22	+	+	+	−	+	−	−	+	+	−	+	−	−	+	+	+	+	−	−	−	−	+	−	−	−	+	+	−	−	−	+	+	−	+	−	+	+	+

EXHIBIT V.3: SET OF BALANCED HALF SAMPLES FOR 16 SELF-REPRESENTING PSUS AND 23 PAIRS OF PSUS (Continued)

Half Sample	Self Representing PSU Number																Pair Number for Paired PSUs																					
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	17	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
23	-	+	+	+	-	+	-	-	+	+	-	+	-	-	+	+	+	+	-	-	-	-	+	-	-	-	+	+	-	-	-	+	+	-	+	-	+	+
24	-	-	+	+	+	-	+	-	-	+	+	-	+	-	-	+	+	+	+	-	-	-	-	+	-	-	-	+	+	-	-	-	+	+	-	+	-	+
25	+	-	-	+	+	+	-	+	-	-	+	+	-	+	-	-	+	+	+	+	-	-	-	-	+	-	-	-	+	+	-	-	-	+	+	-	+	-
26	-	+	-	-	+	+	+	-	+	-	-	+	+	-	+	-	-	+	+	+	+	-	-	-	-	+	-	-	-	+	+	-	-	-	+	+	-	+
27	-	-	+	-	-	+	+	+	-	+	-	-	+	+	-	+	-	-	+	+	+	+	-	-	-	-	+	-	-	-	+	+	-	-	-	+	+	-
28	+	-	-	+	-	-	+	+	+	-	+	-	-	+	+	-	+	-	-	+	+	+	+	-	-	-	-	+	-	-	-	+	+	-	-	-	+	+
29	-	+	-	-	+	-	-	+	+	+	-	+	-	-	+	+	-	+	-	-	+	+	+	+	-	-	-	-	+	-	-	-	+	+	-	-	-	+
30	+	-	+	-	-	+	-	-	+	+	+	-	+	-	-	+	+	-	+	-	-	+	+	+	+	-	-	-	-	+	-	-	-	+	+	-	-	-
31	-	+	-	+	-	-	+	-	-	+	+	+	-	+	-	-	+	+	-	+	-	-	+	+	+	+	-	-	-	-	+	-	-	-	+	+	-	-
32	+	-	+	-	+	-	-	+	-	-	+	+	+	-	+	-	-	+	+	-	+	-	-	+	+	+	+	-	-	-	-	+	-	-	-	+	+	-
33	-	+	-	+	-	+	-	-	+	-	-	+	+	+	-	+	-	-	+	+	-	+	-	-	+	+	+	+	-	-	-	-	+	-	-	-	+	+
34	-	-	+	-	+	-	+	-	-	+	-	-	+	+	+	-	+	-	-	+	+	-	+	-	-	+	+	+	+	-	-	-	-	+	-	-	-	+
35	-	-	-	+	-	+	-	+	-	-	+	-	-	+	+	+	-	+	-	-	+	+	-	+	-	-	+	+	+	+	-	-	-	-	+	-	-	-
36	+	-	-	-	+	-	+	-	+	-	-	+	-	-	+	+	+	-	+	-	-	+	+	-	+	-	-	+	+	+	+	-	-	-	-	+	-	-
37	+	+	-	-	-	+	-	+	-	+	-	-	+	-	-	+	+	+	-	+	-	-	+	+	-	+	-	-	+	+	+	+	-	-	-	-	+	-
38	-	+	+	-	-	-	+	-	+	-	+	-	-	+	-	-	+	+	+	-	+	-	-	+	+	-	+	-	-	+	+	+	+	-	-	-	-	+
39	-	-	+	+	-	-	-	+	-	+	-	+	-	-	+	-	-	+	+	+	-	+	-	-	+	+	-	+	-	-	+	+	+	+	-	-	-	-
40	-	-	-	+	+	-	-	-	+	-	+	-	+	-	-	+	-	-	+	+	+	-	+	-	-	+	+	-	+	-	-	+	+	+	+	-	-	-
41	+	-	-	-	+	+	-	-	-	+	-	+	-	+	-	-	+	-	-	+	+	+	-	+	-	-	+	+	-	+	-	-	+	+	+	+	-	-
42	-	+	-	-	-	+	+	-	-	-	+	-	+	-	+	-	-	+	-	-	+	+	+	-	+	-	-	+	+	-	+	-	-	+	+	+	+	-
43	+	-	+	-	-	-	+	+	-	-	-	+	-	+	-	+	-	-	+	-	-	+	+	+	-	+	-	-	+	+	-	+	-	-	+	+	+	+
44	-	+	-	+	-	-	-	+	+	-	-	-	+	-	+	-	+	-	-	+	-	-	+	+	+	-	+	-	-	+	+	-	+	-	-	+	+	+

EXHIBIT V.3: SET OF BALANCED HALF SAMPLES FOR 16 SELF-REPRESENTING PSUS AND 23 PAIRS OF PSUS (Continued)

Half Sample	Self Representing PSU Number																Pair Number for Paired PSUs																			
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	17	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
45	+	−	+	−	+	−	−	−	+	+	−	−	−	+	−	+	−	+	−	−	+	−	−	+	+	+	−	+	+	−	+	+	−	+	−	−	+	+
46	+	+	−	+	−	+	−	−	−	+	+	−	−	−	+	−	+	−	+	−	−	+	−	−	+	+	+	−	+	−	−	+	+	−	+	−	−	+
47	+	+	+	−	+	−	+	−	−	−	+	+	−	−	−	+	−	+	−	+	−	−	+	−	−	+	+	+	−	+	−	−	+	+	−	+	−	−
48	+	+	+	+	−	+	−	+	−	−	−	+	+	−	−	−	+	−	+	−	+	−	−	+	−	−	+	+	+	−	+	−	−	+	+	−	+	−
49	+	+	+	+	+	−	+	−	+	−	−	−	+	+	−	−	−	+	−	+	−	+	−	−	+	−	−	+	+	+	−	+	−	−	+	+	−	+
50	+	+	+	+	+	+	−	+	−	+	−	−	−	+	+	−	−	−	+	−	+	−	+	−	−	+	−	−	+	+	+	−	+	−	−	+	+	−
51	−	+	+	+	+	+	+	−	+	−	+	−	−	−	+	+	−	−	−	+	−	+	−	+	−	−	+	−	−	+	+	+	−	+	−	−	+	+
52	+	−	+	+	+	+	+	+	−	+	−	+	−	−	−	+	+	−	−	−	+	−	+	−	+	−	−	+	−	−	+	+	+	−	+	−	−	+
53	−	+	−	+	+	+	+	+	+	−	+	−	+	−	−	−	+	+	−	−	−	+	−	+	−	+	−	−	+	−	−	+	+	+	−	+	−	−
54	+	−	+	−	+	+	+	+	+	+	−	+	−	+	−	−	−	+	+	−	−	−	+	−	+	−	+	−	−	+	−	−	+	+	+	−	+	−
55	+	+	−	+	−	+	+	+	+	+	+	−	+	−	+	−	−	−	+	+	−	−	−	+	−	+	−	+	−	−	+	−	−	+	+	+	−	+
56	−	+	+	−	+	−	+	+	+	+	+	+	−	+	−	+	−	−	−	+	+	−	−	−	+	−	+	−	+	−	−	+	−	−	+	+	+	−
57	−	−	+	+	−	+	−	+	+	+	+	+	+	−	+	−	+	−	−	−	+	+	−	−	−	+	−	+	−	+	−	−	+	−	−	+	+	+
58	−	−	−	+	+	−	+	−	+	+	+	+	+	+	−	+	−	+	−	−	−	+	+	−	−	−	+	−	+	−	+	−	−	+	−	−	+	+
59	+	−	−	−	+	+	−	+	−	+	+	+	+	+	+	−	+	−	+	−	−	−	+	+	−	−	−	+	−	+	−	+	−	−	+	−	−	+
60	+	+	−	−	−	+	+	−	+	−	+	+	+	+	+	+	−	+	−	+	−	−	−	+	+	−	−	−	+	−	+	−	+	−	−	+	−	−
61	−	+	+	−	−	−	+	+	−	+	−	+	+	+	+	+	+	−	+	−	+	−	−	−	+	+	−	−	−	+	−	+	−	+	−	−	+	−
62	−	−	+	+	−	−	−	+	+	−	+	−	+	+	+	+	+	+	−	+	−	+	−	−	−	+	+	−	−	−	+	−	+	−	+	−	−	+
63	−	−	−	+	+	−	−	−	+	+	−	+	−	+	+	+	+	+	+	−	+	−	+	−	−	−	+	+	−	−	−	+	−	+	−	+	−	−
64	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+

Two half-samples are identified in an objective manner for each of the 38 separate PSUs or PSU pairs. A + sign has been objectively assigned to one half-sample and a - sign to the other. A row in the table identifies a particular half-sample, with the half-sample of the indicated sign being taken from each of the 38 groups.

Since comparisons of incidence and amount of abuse, by buy, were of interest for studying the effects of participant-vendor familiarity, separate variance estimates, by buy, computed. Estimates of vendor overcharges and undercharges by buy, along with corresponding standard error estimates, are given in Table IV.1 in Appendix IV.

The data sets used for each replication were weighted as part of the national sample. There needed to be additional weighting adjustments for each of the 64 replications so that the results for a given replication were dimensionally the same as the national data set. There were two steps proposed. The first involved multiplying the weight w'_{ij} (from Equation V.14) by 2. This is an adjusted weight for the incidence estimates.

For the amount of abuse estimates, the weight w'_{ij} multiplied by 2 was then further adjusted for each replicate by a ratio similar to that used for the final weighting stage for the full sample, shown in Equation V.21. Specifically, the weight adjustment for each replicate was:

$$f_{3(r)} = {}_{91}R/{}_{91}R'_{(r)} \qquad \textbf{(V.25)}$$

where ${}_{91}R$ is defined for Equation V.21,

$${}_{91}R'_{(r)} = 2 \sum_i \sum_j {}_{91}R_{ij}\, W'_{ij}$$

which is the weighted sum of the July 1991 retail redemption amounts, summed across the sample vendors in half-sample replicate r.

Applying the adjustment given in Equation V.25, the weight $w^{(iv)}_{y(r)}$ assigned to each member of half-sample replicate r was computed as:

$$w_{ij(r)}{}^{IV} = f_{3(r)}(2w'_{ij}). \qquad \textbf{(V.26)}$$

Since each respondent was contained in 32 of the 64 replicates, each respondent had 32 separate weights for estimating the variance of an estimated overcharge amount.

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APPENDIX VI:

FREQUENCIES OF MISCHARGING AND PROGRAM VIOLATIONS BY NUMBER OF PERSONS IN LINE

APPENDIX VI

FREQUENCIES OF MISCHARGING AND PROGRAM VIOLATIONS BY NUMBER OF PERSONS IN LINE

Investigators conducting compliance buys were requested to note the number of persons in the check-out line before them and behind them (Table VI.1). This information was subsequently compared to the occurrences of purchase price entry program violations (Table VI.2), the occurrences in which the participant was not asked for an ID card (Table VI.3), and the occurrences in which countersign violations were noted (Table VI.4).

Table VI.1 presents the number of persons in line associated with each of the compliance buys. Each of Tables VI.2, VI.3, and VI.4 includes the percent of total buys for a cell from Table VI.1 that had the specified violation. In terms of the length of lines, no systematic tendencies are evident for any of the three violations investigated in these tables.

TABLE VI.1

TOTAL NUMBER OF BUYS (UNWEIGHTED) BY THE LENGTH OF THE CASH REGISTER LINE AT THE POINTS OF ENTRY AND PURCHASE (Total Buys = 3,543*)

Number of Persons in Line at the Point of Purchase	Number of Persons in Line at the Point of Entry with Column Percents				
	0	1	2	3 or more	TOTAL
0	987 58.2%	361 31.4%	93 20.5%	33 14.5%	1,474 41.8%
1	501 29.6%	485 42.2%	198 43.6%	63 27.6%	1,247 35.4%
2	147 8.7%	210 18.3%	102 22.5%	68 29.8%	527 14.9%
3 or more	60 3.5%	93 8.1%	61 13.4%	64 28.1%	278 7.9%
TOTAL	1,695 100%	1,149 100%	454 100%	228 100%	3,526 100%

*Total number of buys (3,543) exceeds the number tallied in this table (3,526) because length-of-line information was missing on 17 buys.

TABLE VI.2

THE NUMBER OF BUYS (UNWEIGHTED) WITH VENDOR PURCHASE PRICE ENTRY VIOLATIONS, BY THE LENGTH OF THE CASH REGISTER LINE AT THE POINTS OF ENTRY AND PURCHASE
Including Percents of Cell Totals (Table VI.1)*

Number of Persons in Line at the Point of Purchase	Number of Persons in Line at the Point of Entry				
	0	1	2	3 or more	TOTAL
0	175 17.7%	46 12.7%	11 11.8%	3 9.1%	235 15.9%
1	54 10.8%	57 11.7%	22 11.1%	8 11.8%	140 11.2%
2	13 8.8%	21 10.0%	5 4.9%	8 11.8%	47 8.9%
3 or more	7 11.7%	7 7.5%	5 8.2%	7 10.9%	26 9.4%
TOTAL	249 14.7%	131 11.4%	43 9.5%	25 11.0%	448 12.7%

*Percent equals the cell observations divided by the corresponding total cell observations noted in Table VI.1. For example, the 0,0 cell was calculated by dividing 175 observations in Table VI.2 by 987, the corresponding cell in Table VI.1.

TABLE VI.3

THE NUMBER OF BUYS (UNWEIGHTED) FOR WHICH THE CASHIER DID NOT ASK THE INVESTIGATOR FOR HIS/HER ID CARD, BY THE LENGTH OF THE CASH REGISTER LINE AT THE POINTS OF ENTRY AND PURCHASE

Including Percents of Cell Totals (Table VI.1)*

Number of Persons in Line at the Point of Purchase	Number of Persons in Line at the Point of Entry				
	0	1	2	3 or more	TOTAL
0	586 59.4%	229 63.4%	59 63.4%	19 57.6%	893 60.6%
1	328 65.5%	288 59.4%	107 54.0%	38 60.3%	761 61.0%
2	92 62.6%	122 58.1%	51 50.0%	34 50.0%	299 56.7%
3 or more	36 60.0%	46 49.5%	33 54.1%	35 54.7%	150 54.0%
TOTAL	1,042 61.5%	685 59.6 %	250 55.1%	126 55.3%	2,103 59.6%

*Percent equals the cell observations divided by the corresponding total cell observations noted in Table VI.1. For example, the 0,0 cell was calculated by dividing 586 observations in Table VI.2 by 987, the corresponding cell in Table VI.1.

TABLE VI.4

THE NUMBER OF BUYS (UNWEIGHTED) WITH VENDOR-INITIATED, PARTICIPANT COUNTERSIGN VIOLATIONS, BY THE LENGTH OF THE CASH REGISTER LINE AT THE POINTS OF ENTRY AND PURCHASE Including Percents of Cell Totals (Table VI.1)*

Number of Persons in Line at the Point of Purchase	Number of Persons in Line at the Point of Entry				
	0	1	2	3 or more	TOTAL
0	333 33.7%	120 33.2%	27 29.0%	13 39.4%	493 33.5%
1	151 30.1%	166 34.2%	79 39.9%	23 36.5%	419 33.6%
2	48 32.7%	85 40.5%	50 49.0%	25 36.8%	208 39.5%
3 or more	19 31.7%	31 33.3%	29 47.5%	36 56.3%	115 41.4%
TOTAL	551 32.5%	402 35.0%	185 40.8%	97 42.5%	1,235 59.6%

*Percent equals the cell observations divided by the corresponding total cell observations noted in Table VI.1. For example, the 0,0 cell was calculated by dividing 333 observations in Table VI.2 by 987, the corresponding cell in Table VI.1.

APPENDIX VII:

ORIGINAL PROPOSED PROCEDURE FOR ESTIMATING SYSTEMATIC OVERCHARGING

APPENDIX VII

ORIGINAL PROPOSED PROCEDURE FOR ESTIMATING SYSTEMATIC OVERCHARGING

During the development of the analysis plan for this study it was proposed that it would be possible to estimate the net systematic overcharging if one made the assumption that the likelihood of non-intentional overcharging was the same as the likelihood of undercharging, and that all undercharging is random or non-systematic. Since we would be measuring both the amount of overcharging and undercharging, the net systematic overcharging could be considered equal to all measured overcharging less the random undercharging.

The proposed approach noted that the amount overcharged would, at best, be representative of a group of vendors. It could not be calculated for a single vendor since it would not be possible to separate out the random component for each compliance buy. However, it was thought that an estimate of the amount overcharged based on groups of compliance buys, which translates into groups of vendors, could be made. The minimum size of the group required would depend on the prevalence of overcharging and random charging errors. If errors occurred frequently and systematic overcharging occurred frequently, then both would show up even in a small sample. But if errors and systematic overcharging were infrequent, then a large sample would be needed in order to detect them. There would need to be a sufficient number (at least five each) of errors and overcharges in each sample in order to calculate expected values for systematic overcharges.

As is noted on page 22 of this report, this estimating procedure was not possible because the magnitude and nature of the measured undercharging suggested something other than random error. Therefore, depending on the presentation, information is provided for "pure" overcharging and undercharging, and "net" overcharging where the total undercharges are subtracted from the total overcharges.

APPENDIX VIII:

NOT TO EXCEED PROVISIONS

APPENDIX VIII

"NOT TO EXCEED" PROVISIONS

Table VIII.1 lists those States having a "Not to Exceed" provision in the wording on their WIC vouchers, as well as those States not having such a provision. Of the 30 States in the study, 24 had a "Not to Exceed" provision.

TABLE VIII.1

DESIGNATION OF WHICH STATES HAVE, AND DO NOT HAVE, "NOT TO EXCEED" AMOUNTS ENTERED ON THEIR FOOD INSTRUMENTS

ALL STATES IN WIC VENDOR ISSUES STUDY			
States with a "Not to Exceed" Provision			States with No "Not to Exceed" Provision
Arizona	Kansas	North Carolina	Alabama
Arkansas	Maryland	Ohio	Kentucky
California	Massachusetts	Pennsylvania	Louisiana
Florida	Michigan	South Carolina	Minnesota
Georgia	Missouri	Tennessee	Nevada
Illinois	Nebraska	Texas	West Virginia
Indiana	New Jersey	Virginia	
Iowa	New York	Wyoming	

Table VIII.2 examines whether there was a relationship between the use of Not to Exceed vouchers and checks and those without a Not to Exceed amount and the incidence of overcharging, undercharging, or under and overcharging (mixed). These weighted data show no trends in either direction. For example, while pure overchargers comprised 17 percent of the vendors in states using FIs with a Not to Exceed statement, an equal percent of vendors (17%) overcharged in states with no Not to Exceed statements (Table VIII.2)

For the estimated dollar impacts (Table VIII.3), there is considerably higher amounts for both overcharging and undercharging by vendors in states with Not to Exceed limits as compared to vendors in other states. However, this is a consequence of the fact that most of the vendors (i.e., an estimated 78%) are located in states that do not have Not to Exceed limits.

TABLE VIII.2

ESTIMATED INCIDENCE* OF VENDOR MISCHARGING BY WHETHER "NOT TO EXCEED" (NTE) AMOUNTS ARE ENTERED ON THE FOOD INSTRUMENTS (FIs): by Row Percents

NTE Usage	Unweighted Number of Vendors	Estimated Number of Vendors				
		No Mis-charging	Pure Over-charging	Pure Under-charging	Under & Over charge	TOTAL
Vendor's State Uses NTEs	928	17,744 67.2%	4,500 17.1%	2,782 10.5%	1,374 5.2%	26,400 100%
Vendor's State Does Not Use NTEs	277	4,823 63.2%	1,294 16.9%	1,120 14.7%	397 5.2%	7,633 100%
TOTAL	1,205	22,5677 66.3%	5,794 17.0%	3,902 11.5%	1,771 5.2%	34,033 100%

*Based on Compliance Buys Made During the Summer of 1991.

TABLE VIII.3

ESTIMATED DOLLAR IMPACT IN MILLIONS OF DOLLARS OF MISCHARGING BY WHETHER "NOT TO EXCEED" AMOUNTS ARE ENTERED ON THE FOOD INSTRUMENTS:
by Column Percents

NTE Usage	Unweighted Number of Vendors	Estimated Annual Amount (Millions of Dollars)			
		Pure Over-charging	Pure Under-charging	Under & Over charge	TOTAL
Vendor's State Uses NTEs	928	$26.5 87%	-$5.9 80%	$ 5.4 114%	$26.0 94%
Vendor's State Does Not Use NTEs	277	$3.8 13%	-$1.5 20%	-$ 0.7 -14%	$ 1.6 6%
TOTAL	1,205	$30.3 100%	-$7.4 100%	$ 4.7 100%	$27.6 100%

*Based on Compliance Buys Made During the Summer of 1991.

APPENDIX IX:

DISTRIBUTIONS OF MISCHARGES AND REPEAT MISCHARGE AMOUNTS

APPENDIX IX

DISTRIBUTIONS OF MISCHARGES AND REPEAT MISCHARGE AMOUNTS

An unweighted distribution of the amount of vendor mischarges by buy across 3,543 safe buys is given in Table IX.1 and illustrated in Exhibit IX.1. Most of the mischarges (78.5%) are zero. Of the 760 nonzero mischarges 196 (26%) are less than $.25. Over 50% (389) of the nonzero mischarges are less than $1.00. Also, it is interesting to note that the overcharges that are less than $.25 occur with about the same frequency as undercharges that are less than $.25. This suggests, but does not prove, that a large portion of these small overcharges and undercharges are random and approximately offsetting.

A weighted distribution of the average vendor mischarge is given in Table IX.2 and illustrated in Exhibit IX.2. This distribution refers to the net average mischarge across three safe buys for the sample vendors. The distribution shows that an estimated two-thirds of the vendors would have a net mischarge of zero across three safe buys if all vendors in the sampling frame were included in the three-buy experiment. Because the vendor distribution is that of an average, its variance is lower than that for the distribution of the individual buy mischarges shown in Exhibit IX.1. (That is, extreme mischarges on buys tend to be averaged out across the other buys.) Accounting for the lower variance, the properties of the distribution of vendor average mischarges are similar to those of the distribution of buy mischarges.

One of the main concerns is that of separating the random mischarges from the intentional ones. Although this cannot be done with the data collected in this study, an attempt was made to shed some light on this issue by looking at repeat offenders. The idea is that vendors who commit an overcharge (or undercharge) on more than one buy are most likely intentional mischargers.

Tables IX.3-IX.6 and Exhibits IX.3-IX.4 provide data and illustrations on repeat offenders. Tables IX.3 and IX.4 and Exhibits IX.3 and IX.4 cover all multiple overchargers and underchargers, while Tables IX.5 and IX.6 focus on only those with multiple mischarges of $.50 or less.

The estimated number of vendors with multiple overcharges (2472) or undercharges (1493) together constitute only 11.7 percent of the estimated number of vendors (i.e., 3965/34033). These multiple mischargers constitute about 35 percent of the estimated number of vendors that have a nonzero net mischarge amount [i.e., 3965/(34033-22600].

As might be anticipated, the estimated number of vendors with repeat "nickel and dime" overcharges or undercharges (Tables IX.5 and IX.6) is quite small relative to the total: only about 3 percent of total vendors (i.e., 980/34033). It is possible that most, if not all, of these overcharges are random since small mischarges are not very beneficial to a vendor. Of all repeat mischargers, the "nickel and dime" repeat mischargers constitute an estimated 25 percent (i.e., 980/3965).

A major problem with the repeat mischarge results is that, even if committing a repeat offense does indeed identify intentional overchargers, the incidence of repeat violators in the sample may be far below the actual incidence of intentional overcharging, since these data are based only on three buys. If a greater number of buys were used in the study, a larger number (and percent) of multiple offenders would have been detected. With only three buys, the estimated incidence of repeat offending may provide too low a lower bound of the incidence of intentional mischarging to be useful.

TABLE IX.1

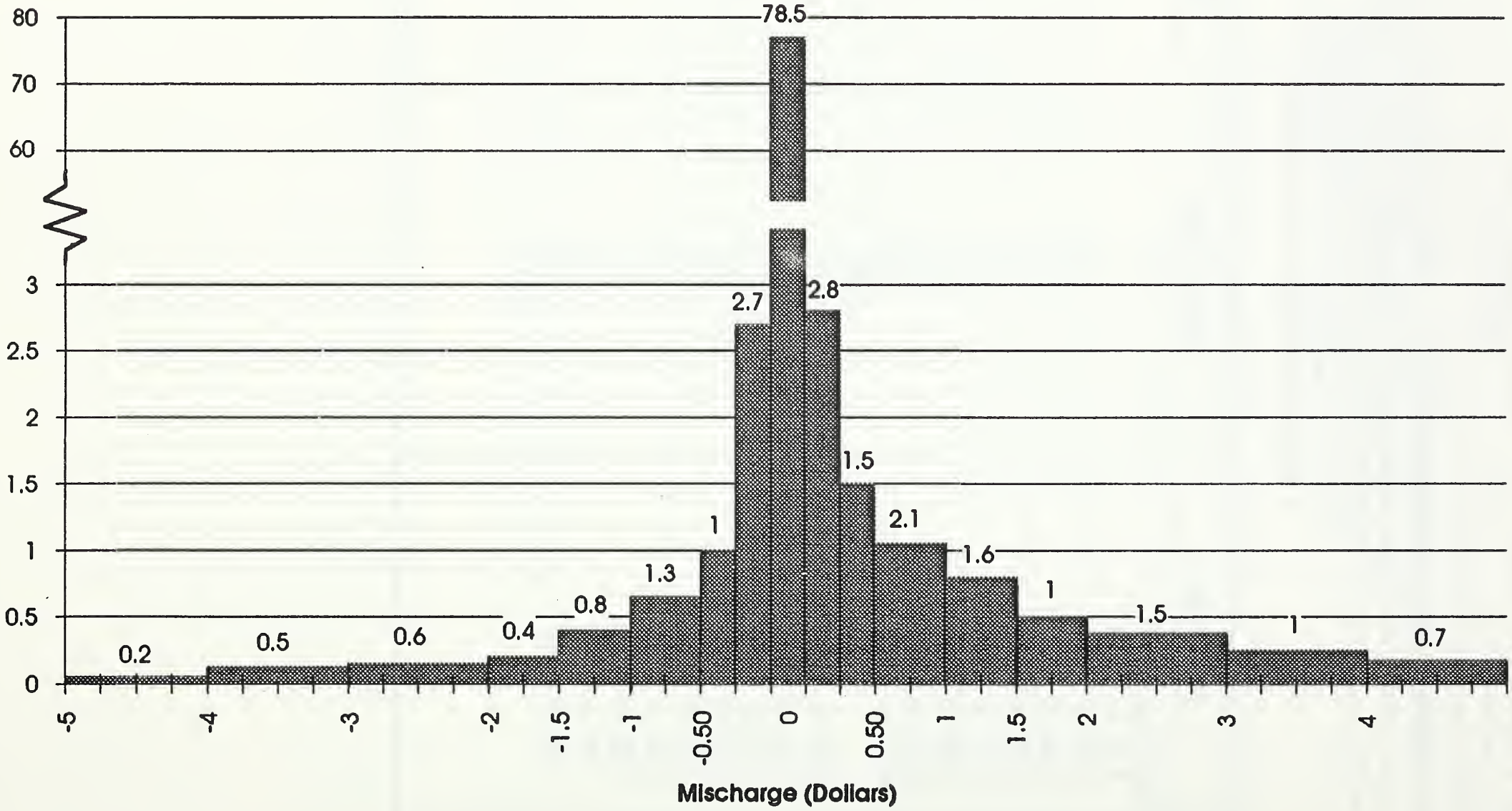
UNWEIGHTED DISTRIBUTION OF BUYS BY AMOUNT OF MISCHARGE, WHERE THE MISCHARGE EQUALS THE AMOUNT REDEEMED MINUS THE SHELF PRICE

(A positive mischarge is an overcharge and a negative mischarge is an undercharge)

Mischarge	No. of Buys	Percent of Buys
Less than -$5.00	27	0.8
-5.00 to -4.01	7	0.2
-4.00 to -3.01	16	0.5
-3.00 to -2.01	21	0.6
-2.00 to -1.51	15	0.4
-1.50 to -1.01	27	0.8
-1.00 to -0.51	47	1.3
-0.50 to -0.26	36	1.0
-0.25 to -0.01	97	2.7
0.00	2783	78.5
0.01 to 0.24	99	2.8
0.25 to 0.49	54	1.5
0.50 to 0.99	73	2.1
1.00 to 1.49	56	1.6
1.50 to 1.99	34	1.0
2.00 to 2.99	52	1.5
3.00 to 3.99	36	1.0
4.00 to 4.99	25	0.7
5.00 or more	38	1.1
	3543	100.1

EXHIBIT IX.1

Percentage Distribution (Unweighted) of Vendor Mischarge Amount Across 3,543 Buys, Where the Mischarge for Each Buy Equals the Redeemed Amount Minus the Shelf Price. (A Positive Mischarge Is an Overcharge and a Negative Mischarge Is an Undercharge.) *



* This graph represents all compliance buys except for 0.8% of the buys that had mischarges of less than -$5, and 1.1% of the buys that had mischarges of $5 or more. As represented by the middle bar on the graph, 78.5% of the buys had no mischarge.

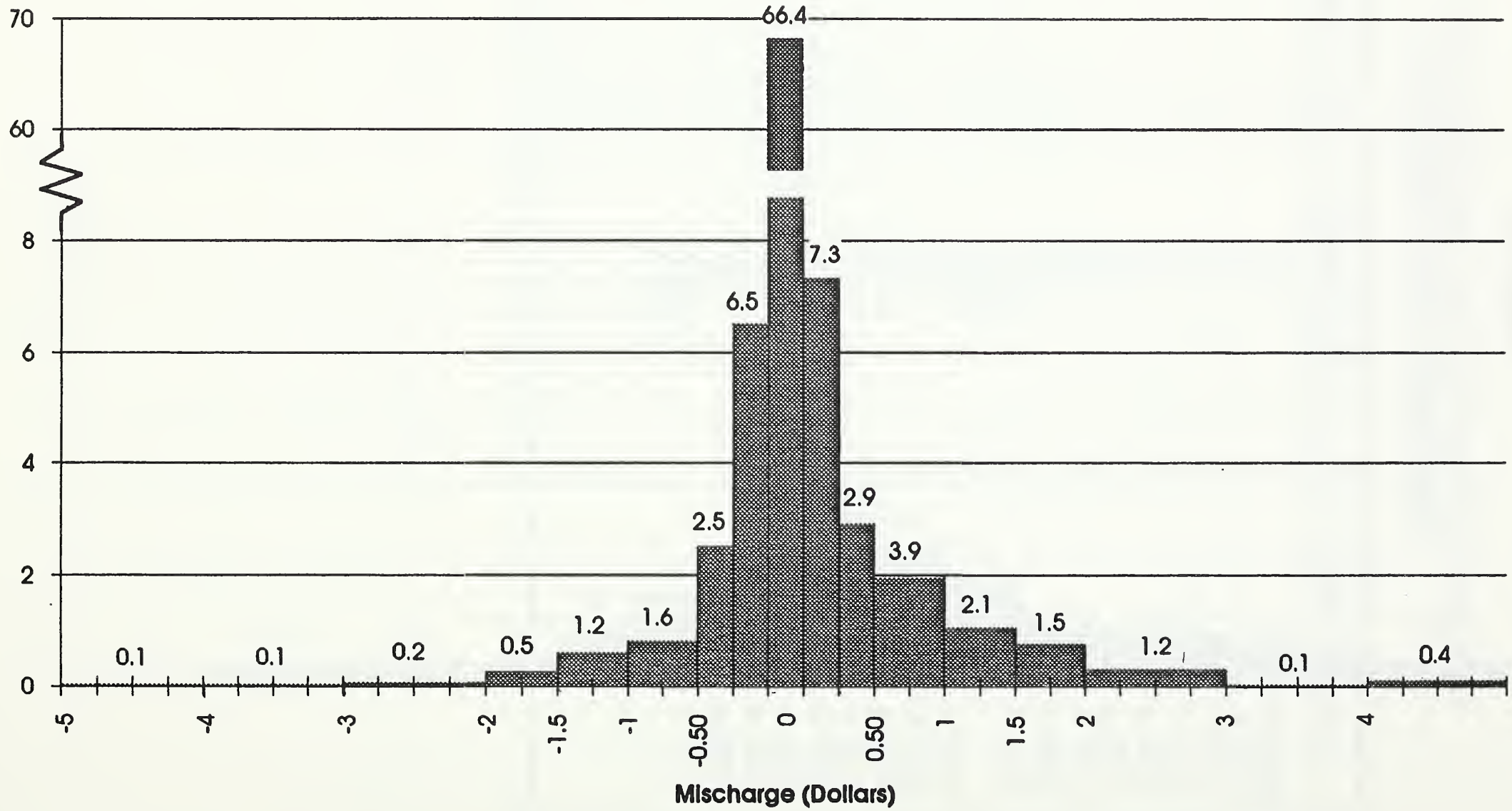
TABLE IX.2

WEIGHTED DISTRIBUTION OF VENDORS BY THE AVERAGE MISCHARGE ACROSS THREE BUYS

Average Mischarge	No. of Vendors	Percent of Vendors
Less than -$5.00	274	0.8
-5.00 to -4.01	30	0.1
-4.00 to -3.01	20	0.1
-3.00 to -2.01	78	0.2
-2.00 to -1.51	154	0.5
-1.50 to -1.01	415	1.2
-1.00 to -0.51	542	1.6
-0.50 to -0.26	850	2.5
-0.25 to -0.01	2,199	6.5
0.00	22,600	66.4
0.01 to 0.24	2,469	7.3
0.25 to 0.49	977	2.9
0.50 to 0.99	1,343	3.9
1.00 to 1.49	727	2.1
1.50 to 1.99	521	1.5
2.00 to 2.99	422	1.2
3.00 to 3.99	29	0.1
4.00 to 4.99	121	0.4
5.00 or more	262	0.8
	34,033	100.1

EXHIBIT IX.2

Percentage Distribution (Weighted) of Vendor Mischarges Averaged Across Three Buys, Where the Mischarge for Each Buy Equals the Redeemed Amount Minus the Shelf Price. (A Positive Mischarge Is an Overcharge and a Negative Mischarge Is an Undercharge.) *



* This graph represents all vendors except for 0.8% of the vendors (wtd.) with mischarges under -$5 and another 0.8% of the vendors with mischarges above $5. As represented by the middle bar, 66.4% of the vendors had an avg. mischarge of 0.

TABLE IX.3

REPEAT OVERCHARGE VENDORS

WEIGHTED DISTRIBUTION OF NET VENDOR OVERCHARGES BY AMOUNT AND PERCENT OF CASH PRICE, ACROSS ALL THREE BUYS, FOR VENDORS WHO OVERCHARGED ON AT LEAST TWO OF THREE SAFE BUYS

Overcharge Amount (3 Buys)	Pure Overcharge Vendors (Weighted)	Mixed* Overcharge Vendors (Weighted)	Total Overcharge Vendors (Weighted)	Cumulative Total Overcharge Vendors
0 or less**	0	69	69	69
.01 - .49	322	23	345	414
.50 - .99	252	0	252	666
1.00 - 1.99	231	110	341	1,007
2.00 - 2.99	274	50	324	1,331
3.00 - 4.99	284	40	324	1,655
5.00 - 6.99	297	52	349	2,004
7.00 - 9.99	252	0	252	2,256
10.00 -14.99	53	0	53	2,309
15.00 -19.00	105	0	105	2,414
20.00 or more	39	19	58	2,472

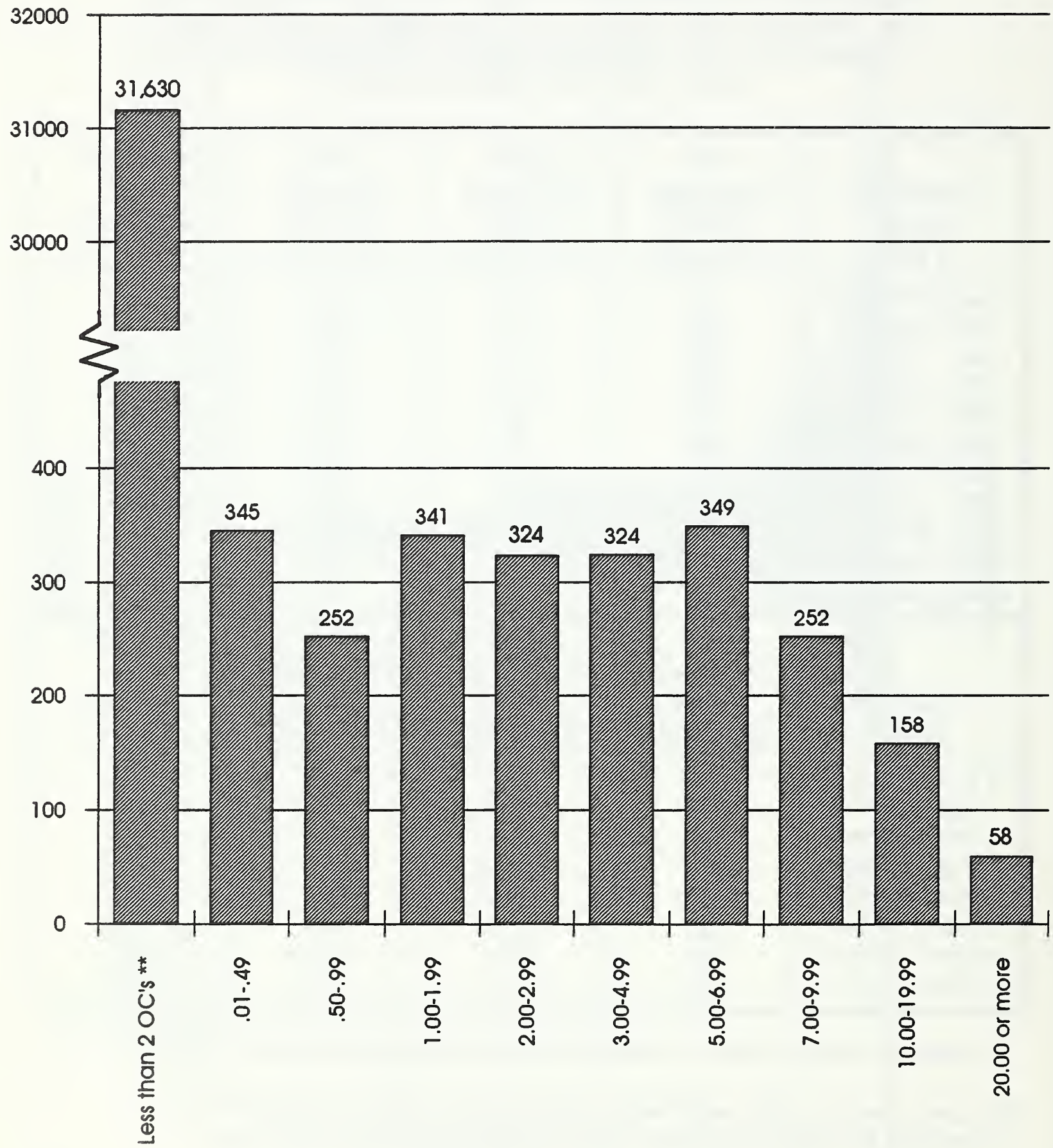
Overcharge Percent	Pure Overcharge Vendors (Weighted)	Mixed* Overcharge Vendors (Weighted)	Total Overcharge Vendors (Weighted)	Cumulative Total Overcharge Vendors
0 or less**	0	69	69	69
.01% - 1.99%	332	23	355	424
2.00% - 4.99%	507	90	597	1,021
5.00% - 9.99%	373	90	463	1,484
10.00% - 14.99%	290	39	329	1,813
15.00% - 19.99%	227	13	240	2,053
20.00% - 29.99%	219	20	239	2,292
30.00% or more	161	19	180	2,472

*A mixed overcharge vendor is a vendor with two overcharge buys and one undercharge buy.

**In these cases the single undercharge is greater than or equal to the total of the two overcharges for mixed overcharge vendors, making the net value zero or less.

EXHIBIT IX.3

Weighted Distribution of Overcharge Amount Across The Three Buys for Vendors Who Overcharged on At Least Two of the Three Buys *



* The estimated number of vendors committing two or more overcharges (2,403) is only 7% of the estimated total number of vendors (34,033).

** Includes vendors with fewer than two overcharges and with a net overcharge of zero or less.

TABLE IX.4

REPEAT UNDERCHARGE VENDORS

WEIGHTED DISTRIBUTION OF NET VENDOR UNDERCHARGES BY AMOUNT AND PERCENT OF CASH PRICE, ACROSS ALL THREE BUYS, FOR VENDORS WHO UNDERCHARGED ON AT LEAST TWO OF THREE SAFE BUYS

Undercharge Amount (3 Buys)	Pure Undercharge Vendors (Weighted)	Mixed* Undercharge Vendors (Weighted)	Total Undercharge Vendors (Weighted)	Cumulative Total Undercharge Vendors
0 or less**	0	211	211	211
.01 - .49	230	0	230	441
.50 - .99	88	68	156	597
1.00 - 1.99	105	98	203	800
2.00 - 2.99	84	137	221	1,021
3.00 - 4.99	120	39	159	1,180
5.00 - 6.99	49	0	49	1,229
7.00 - 9.99	49	0	49	1,278
10.00 -14.99	39	0	39	1,317
15.00 -19.00	39	0	39	1,356
20.00 or more	137	0	137	1,493

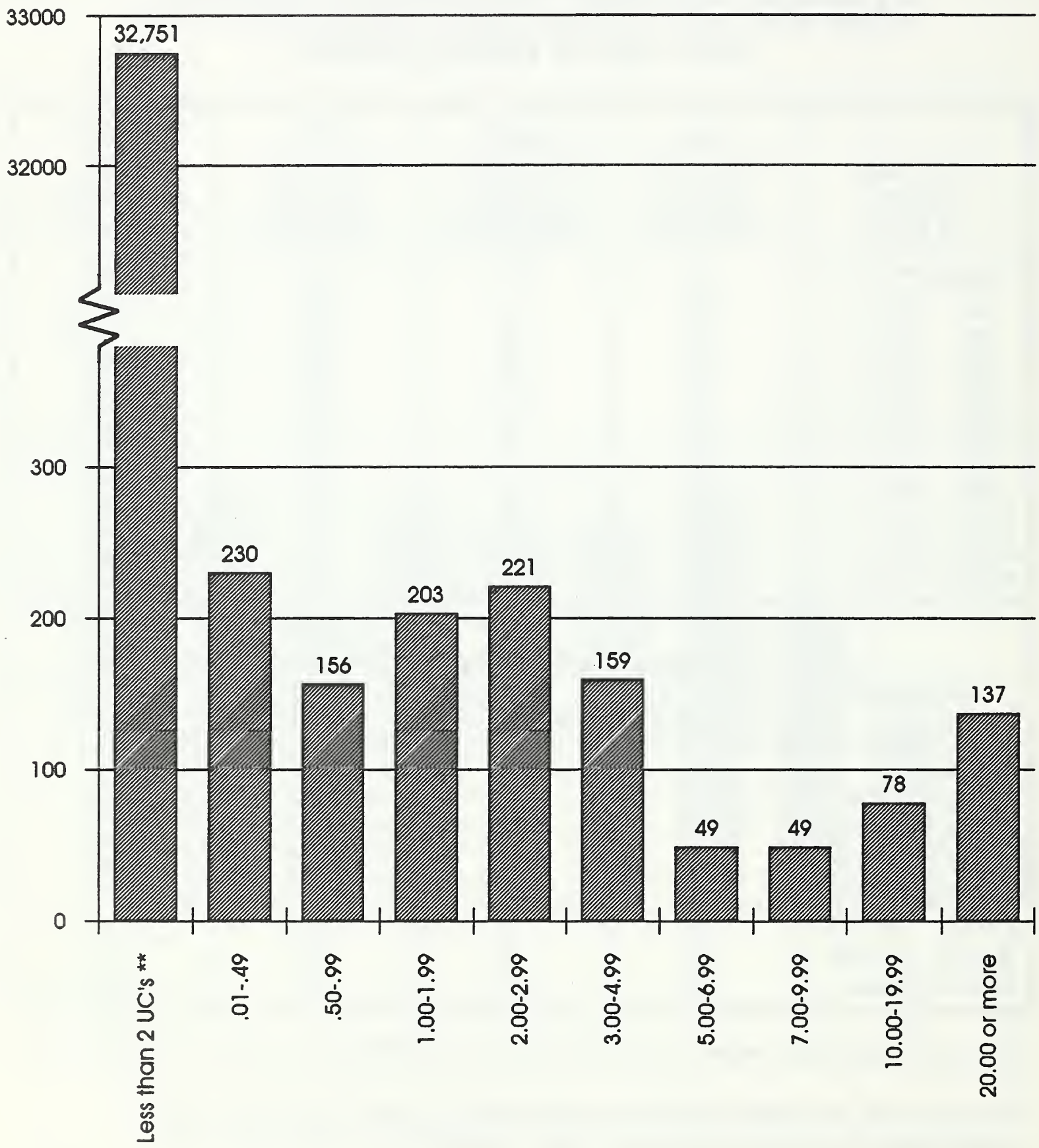
Undercharge Percent	Pure Undercharge Vendors (Weighted)	Mixed* Undercharge Vendors (Weighted)	Total Undercharge Vendors (Weighted)	Cumulative Total Undercharge Vendors
0 or less**	0	211	211	211
.01% - 1.99%	295	88	383	594
2.00% - 4.99%	197	78	275	869
5.00% - 9.99%	242	117	359	1,228
10.00% - 14.99%	88	59	147	1,375
15.00% - 19.99%	78	0	78	1,453
20.00% - 29.99%	20	0	20	1,473
30.00% or more	20	0	20	1,493

*A mixed undercharge vendor is a vendor with two undercharge buys and one overcharge buy.

**In these cases the single overcharge is greater than or equal to the total of the two undercharges for mixed undercharge vendors, making the net value zero or less.

EXHIBIT IX.4

Weighted Distribution of Undercharge Amount Across The Three Buys for Vendors Who Undercharged on At Least Two of the Three Buys *



* The estimated number of vendors committing two or more undercharges (1,282) is only about 3.8% of the estimated total number of vendors (34,033).

** Includes vendors with fewer than two undercharges and with a net undercharge of zero or less.

TABLE IX.5

REPEAT NICKEL AND DIME OVERCHARGERS

WEIGHTED DISTRIBUTION OF NICKEL AND DIME OVERCHARGES FOR VENDORS WITH AT LEAST TWO OVERCHARGES OF $.50 OR LESS*

Overcharge Interval	Weighted No. of Vendors with at Least Two Overcharges in Designated Interval
$.01 - $.10	39
$.01 - $.20	166
$.01 - $.35	423
$.01 - $.50	574

*This table provides cumulative estimates and cannot be used to estimate the number of vendors with two overcharges in an intermediate interval. For example, it is <u>not</u> correct to estimate the number of vendors that have two overcharges between $.11 and $.20 as 127 (i.e., 166 - 39), since many of those vendors would probably have one overcharge between $.01 and $.10 and one overcharge between $.11 and $.20.

TABLE IX.6

REPEAT NICKEL AND DIME UNDERCHARGERS

WEIGHTED DISTRIBUTION OF NICKEL AND DIME UNDERCHARGES FOR VENDORS WITH AT LEAST TWO UNDERCHARGES OF $.50 OR LESS*

Undercharge Interval	Weighted No. of Vendors with at Least Two Undercharges in Designated Interval
$.01 - $.10	13
$.01 - $.20	209
$.01 - $.35	328
$.01 - $.50	406

*The same type of limitation on the interpretation of the numbers in Table IX.5 (see footnote to that table) also applies to this table.

APPENDIX X:

ID REQUEST PROGRAM VIOLATIONS, RAINCHECK PURCHASES, PURCHASE PRICE ENTRY OFFENSES, AND CASE STUDY OF VENDORS ASSIGNED SETS OF BUYS

APPENDIX X

RAINCHECK PURCHASES

Under current guidelines vendors are not to give participants rainchecks for out-of-stock items. Investigators were cautioned against picking up the items promised on the next trip. They were instructed to take the promised items only if the vendor approached them and voluntarily made them available.

A total of seven raincheck purchases were recorded during the study. Five of these involved nutritional formulas, i.e., Similac, Enfamil, Nutramigen, and Ensure, and in each case a written raincheck was issued. The products were obtained at the next buy. Four vendors charged the WIC Program in advance; the fifth did not take the FI until the missing items were picked up.

The sixth raincheck incidence involved missing cheese. Although a raincheck was issued, the amount for the cheese was incorrectly included in a receipt with unauthorized items.

In the seventh situation, no written raincheck was provided for either of two buys where Enfamil and juice were not available. It was suggested the investigator come back. At that time a large overcharge was made on the FI in both visits.

552	Raincheck for cheese. Charged for cheese on FI @ $3.39 per pound. Total for cheese correct but total purchase was not.
721	Raincheck for Similac with iron in Buy 2 picked up on Buy 3.
869	Raincheck of 6 cans of Enfamil concentrate with iron from Safeway - marked already paid for and good for 30 days. Did not use raincheck.
1120	Out of all powdered Nutramigen at second buy; supplied missing items at next buy without receipt.
1123	Out of Ensure - 8 cans owed - Clerk provided 4 of the 12 cans and a hand written receipt for the remainder. She did not take voucher for items purchased. Items were available next visit.
1126	Ensure vanilla and chocolate owed at no charge; completed purchase at later buy.
1169	Missing infant juice and Enfamil with iron - instructed to return for missing items next day. Suggested substitution of cow's milk and had no written raincheck.

APPENDIX X

Table X.1 explores whether the vendor's familiarity with the investigator was reflected in the request to present identification (ID) when making a compliance buy. The data show that familiarity had no effect on ID requests. The vendor was no more likely to ask for client (investigator) identification on the first buy as opposed to the second or third buy. In all three buy situations, the vendor asked for identification less than 40 percent of the time.

TABLE X.1

DISTRIBUTION (UNWEIGHTED) OF WHETHER INVESTIGATOR WAS ASKED FOR THEIR ID CARD, BY BUY SEQUENCE

ID Card	1st Buy	2nd Buy	3rd Buy	TOTAL
Not asked	691 61.1%	706 62.2%	706 63.3%	2,103 62.2%
Asked	440 38.9%	429 37.8%	409 36.7%	1,278 37.8%
TOTAL	1,131	1,135	1,115	3,381

APPENDIX X

OVERCHARGING VENDORS: PURCHASE PRICE ENTRY VIOLATIONS

Table X.2 attempts to provide some insight into the issue of when overcharging vendors actually insert the incorrect (higher) price on the FI: during or after the transaction. If it's after the transaction, does the vendor enter the correct price at the time of purchase and alter it later, or does the vendor fail to record the price at the time of purchase and write in the incorrect price later?

The table is divided into two halves: overcharging vendors who did not commit any other violation, except perhaps one of the two price entry violations enumerated in the table ("light" violators), and overcharging vendors who committed at least one other violation in addition to perhaps a price entry violation ("heavy" violators). (See Section 3.3 for a list of violations.) For each half of the table, estimates are given of the total number of vendors who (1) entered the purchase price on the FI at the time of purchase for all three buys, (2) did not enter the purchase price on the FI at the time of purchase for at least one buy, and (3) entered the correct price on the FI at the time of purchase but altered it later.

An interesting result is that for vendors in the first half of the table (light violators) the purchase price was always entered on the FI at the time of purchase for all three buys. Since the estimated percent of light violators who altered the purchase price after the sale was only 10.1 percent, most of the light violators entered the incorrect price on the FI at the time of purchase.

In the second half of Table X.2, the percent of heavy violators who entered the purchase price correctly on all buys was 54 percent. Since the estimated percent of these vendors who entered the correct amount on the FI at the time of sale and then altered the price on the FI after the sale was also only about 10 percent, it is likely that many of these vendors also entered the incorrect price on the FI at the time of sale.

These results suggest that vendors generally record the incorrect (inflated) price on the FI at the time of sale rather than subsequently altering the correct price entered on the FI at the time of sale. Presumably, these vendors assume that WIC participants typically do not pay much attention to the price that the vendor enters on the FI.

TABLE X.2

PURCHASE PRICE ENTRY OFFENSES COMMITTED BY VENDORS WHO OVERCHARGE

Size of Vendor	Total Number of Vendors Who Overcharged (Unweighted)	Estimated Percent of Overcharging Vendors Committing Additional Offenses[1] with Standard Errors in Parentheses								
		Overcharging Vendors with No Additional Offenses with the Exception of the Two Listed Below				Overcharging Vendors with at Least One Additional Offense, Excluding the Two Listed Below				
		Cashier Entered Purchase Price on the Food Instrument at the Time of Purchase		Vendor Altered the Purchase Price on the Food Instrument for at Least One of the Three Buys	Total Vendors (Weighted)	Cashier Entered Purchase Price on the Food Instrument at the Time of Purchase		Vendor Altered the Purchase Price on the Food Instrument for at Least One of the Three Buys	Total Vendors (Weighted)	Total Number of Vendors Who Over-charged (Weighted)
		Always	Not Always			Always	Not Always			
Number of Registers										
1-5	273	100%	0	11.4%	964	53.6%	46.4%	9.6%	5,088	6,052
6 or more	40	100%	0	0	130	73.7%	26.3%	10.1%	1,382	1,512
TOTAL	313	100%	0	10.1%	1,094	58.0%	42.0%	9.7%	6,470	7,564

[1]Percents are by rows with the base of each percent being the weighted vendor total for the corresponding row in the appropriate half of the table.

APPENDIX X

CASE STUDY OF 23 VENDORS ASSIGNED SETS OF BUYS

Prior to implementing the compliance buys a decision was made to conduct a subset of "double buys" in stores doing a high volume of WIC business, so as not to skew the data if major violations were noted in these few stores. As shown in Table X.3 no significant trends occur in any of the extended buy sequences performed by the same investigator.

TABLE X.3

			Net Amount Mischarged by Compliance Buy[1]									
Vendor	WIC	Large Chain Store	1	2	3	4	5	6	7	8	9	10
0113	C	No	0	0	0	-	-	0	0	0	0	0
0124	I	No	0	0	0	-	-	0	0	0	-	-
0141	W	No	0	0	0	0	-	0	0	0	0	-
0145	I	No	0	0	0	-	-	0	0	0	-	-
0167	I	Yes	0	0	0	0	-	-	-	-	-	-
0169	I	Yes	0	0	0	0	-	-	-	-	-	-
0199	I	Yes	0	0	0	0	0	0	-	-	-	-
0209	W	No	0	0	0	0	0	0	1.48	0.44	-	-
0333	C	No	0	0	0	0	-	-	-	-	-	-
0352	C	No	.30	-.70	0	-.50	-.60	.30	1.30	1.69	-.50	-0.6
0380	W	No	0	-1.36	0	-.30	0	0	-	-	-	-
0499	C	No	0	0	0	0	0	22.84	-	-	-	-
0550	I	Yes	0	0	0	0	-	0	0	0	0	-
0587	C	Yes	0	0	0	0	0	0	0	0	0	-
0852	I	No	0	0	0	-.30	0	0	0	-	-	-
1003	C	No	.61	-.55	.26	0	-	0	.35	0.41	-1.28	-
1024	W	No	0	0	.10	0	-	.40	.20	0	0	-
1040	C	No	-.44	2.23	3.88	-.31	4.33	0	.26	0	-.72	0
1093	I	No	-1.90	-3.00	0	-	-	-3.20	-3.00	-1.50	-	-
1137	W	No	0	0	.14	-	-	0	0	0	-	-
1208	W	Yes	0	0	0	-	-	0	0	0	-	-
1227	C	Yes	0	0	.02	-	-	-1.41	0	-.02	-	-
1229	C	No	1.65	-.50	1.60	-	-	1.65	-.50	1.60	-	-

[1] Negative numbers indicate undercharging occurred.

APPENDIX XI:

TECHNICAL NOTES ON THE MULTIVARIATE METHODS USED

APPENDIX XI

TECHNICAL NOTES ON THE MULTIVARIATE METHODS USED

In the application of logistic regression and discriminant analysis to predicting overchargers and underchargers, several statistical issues arose relating to the specific models and methods used and the choices of predictor variables. This appendix provides technical support for the multivariate analyses results presented in Chapter 4.

XI.1 SUMMARY OF THE MULTIVARIATE METHODS USED

With the logistic regression procedure, a linear function of the predictor variables is used to classify universe members. The dependent variable is the logarithm of the ratio of p to (1-p), where p is the probability of membership in one of the groups (i.e., the group associated with code "1" for the dependent variable--either overcharging or undercharging in this application). Although the log of a ratio is a fairly complex expression, this function has the property that if p=.5, the value of the ratio of p to (1-p) is 1 (i.e., .5/.5), and hence the value of the dependent variable is zero since the log of 1 is zero. Also, if p>.5, the ratio will be greater than one and therefore the dependent variable will be positive since the log of a number greater than 1 is positive. On the other hand, if p<.5, the ratio will be between 0 and 1 and the dependent variable will be negative since the log of a number between 0 and 1 is negative. This makes the values derived from the logistic regression function easy to interpret since a value of the regression function greater than zero implies an estimated probability of over .5 that the vendor belongs to group "1" (i.e., is an overcharger or undercharger). Likewise, a value of the regression function less than zero implies an estimated probability of less than .5 that the vendor is an overcharger or undercharger.

Although the discriminant function procedure also predicts membership in one of two (or more) groups based on a function of the predictor variables, the methodology differs from the logistic regression. The basic discriminant procedure derives a linear function of the predictor variables which maximizes the distance, measured statistically, between the two groups. The distance measure is a function of the differences between the predictor-variable means for the two groups, computed across all the predictor variables. Based on the values of the predictor variables for a sample case, the discriminant function is used to calculate the probability of the case belonging to each group (e.g., overchargers or non-overchargers). The case is assigned to the group for which the membership probability is the highest, which is the group "closest" statistically to the case being classified.

The basic discriminant analysis method described above relies on the assumption that the predictor variables have a multivariate normal distribution. However, there is a nonparametric version of the discriminant analysis method which does not rely on the normality assumption. Since most of the predictor variables used in this application were 0-1 variables (certainly not normal variables), the nonparametric version of the discriminant analysis method was more applicable than the basic (parametric) version.

XI.2 CHOICES OF VARIABLES FOR LOGISTIC REGRESSION

The set of predictor variables considered for the logistic regression model are given in Table 4.2 of Chapter 4. Some of these variables are variations of the same basic measure. In such cases, only one of the variations was included in any of the regression runs. For example, the variables "IN_LINE," "BUSY," "NOT BUSY" and "NOTBUSY (alt.)" all refer to measures of the length of the cash register lines at the time of checkout. The first of these variables used in the model was "IN_LINE." However, this appeared to be too fine a measure to be useful and was replaced by "BUSY." Although this variable seemed to be useful, two alternate measures, "NOTBUSY" and "NOTBUSY (alt.)," were also tried when it was suggested that overcharging might be more prevalent when there was no cash register line at all. For any single regression run, only one of these four variables was used.

Likewise, the variables "STOR_REG" and "REG_GT5" are two variations on measures of the number of cash registers. Initially, "STOR_REG" was used. However, as with "IN_LINE," this measure seemed to be too fine. It was replaced by "REG_GT5" which turned out to be a useful predictor variable.

The initial stepwise logistic runs, which were based on a pool of nine predictor variables, did not converge for predicting either overcharges or undercharges. This initial pool of variables included "IN_LINE," "STOR_REG," and "OVERAFTT." To improve the effectiveness of the logistic regressions, "IN_LINE" and "STOR_REG" were replaced by less precisely defined measures, "BUSY" and "REG_GT5." In addition, the variable "OVERAFTT" was removed because it took on the value "1" for only about 3.7 percent of the vendors. After these modifications there were a total of eight variables used in the stepwise regression pool. In addition to the two noted above, the variables included in the predictor pool were AUTORDR, CHECK, W_C, REQ_SIGN, REG_RCPT, and ADEQ_STK. It turned out that, among the predictor pools that were used to predict overchargers, this predictor pool performed the best in terms of the criteria that were applied.

XI.3 CHOICES OF PARAMETERS FOR THE DISCRIMINANT ANALYSIS MODEL

Because the predictor variables clearly did not have a multivariable normal distribution, a nonparametric discriminant model was used. In applying a nonparametric model, the SAS program also required a choice of either the "nearest-neighbor" method or the "kernel" method as the nonparametric model to use. The nearest-neighbor model was selected because it was easy to interpret and seemed like a reasonable method. With this procedure, and the use of a prior distribution of overchargers equal to the distribution found in the sample (i.e., proportional priors), the conditional probability that a vendor was an overcharger was estimated as the proportion of overchargers among the k "nearest" neighbors, where the distance between sample data points was determined by a generalized measure of distance based on the similarity of the

predictor variabilities.[1] If this conditional probability exceeded one-half, the vendor was classified as an overcharger.

The SAS manual suggests that the choice of k is relatively unimportant. Therefore, an arbitrary choice of k=100 was made for the first set of runs. However, upon further reflection, it was decided that a lower value of k would be better for this application. With a relatively high value of k it is more difficult for cases to be classified as overchargers since there are considerably more non-overchargers in the sample than overchargers. (That is, it may be rare to find a majority of overchargers among the 100 nearest neighbors when only about 27% of the sample are overchargers.) Therefore, in order to improve the sensitivity of detecting overchargers, the main discriminant runs were carried out for k=11.

As expected, the sensitivity to identifying overchargers was much lower for the k=100 case as compared to the k=11 case. For the first test sample, the sensitivity was only 29% versus 46% for the k=11 case. However, the overall correct rate was slightly higher for the k=100 case as compared to the k=11 case for the first test sample (i.e., 74.9% vs. 74.0%), even though the sensitivity was so much worse. When the sensitivity rate fell considerably for the second test sample for the k=11 case (i.e., from 44.6% to 15.5%), it was still considerably higher than for the k=100 case, which was zero (i.e., all cases were classified as non-overchargers for both the development and test samples).

For this application, the k=11 model was better than the k=100 model. However, it is possible that other values of k could improve the performance of the discriminant model for this application.

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[1]The measure of distance used is the Mahalanobis distance, which is discussed by Vacek and Ashikaga, "An Examination of the Nearest Neighbor Rule for Imputing Missing Values," Proceedings of the Statistical Computing Section, American Statistical Association, 1980, pp. 326-331.

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